

Patent Owner Demonstrative

Texas Instruments Incorporated (Petitioner)

v.

ParkerVision Inc. (Patent Owner)

Case: IPR2024-00936

U.S. Patent No. 9,118,528

Oral Hearing: September 10, 2025

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

1

Conception: at least as early as Jan. 20, 1998

Reduced To Practice: at least as early as April 29, 1998

Conception

Sorrells' Testimony:

5. In the summer of 1996, ParkerVision began to design its first integrated circuit (IC) chip called "Eddie." ParkerVision completed the design of the Eddie chip by early 1997. [REDACTED]
6. By early 1997, ParkerVision completed the layout for the Eddie chip.
7. The layout of the first Eddie chip can be found in a file [REDACTED] (Exhibit 2012).

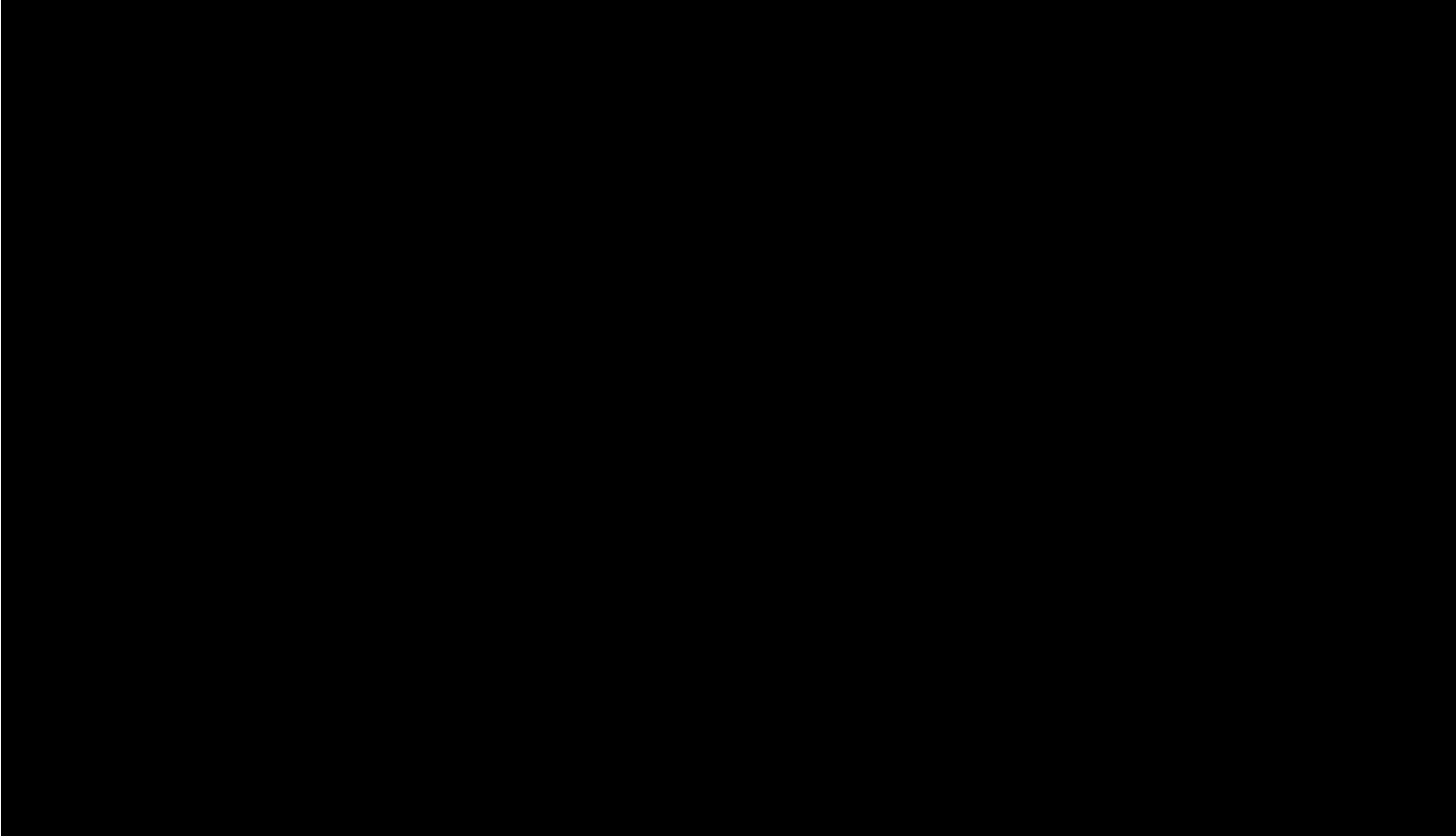
Conception

POR, 23-27; Ex. 2016, ¶¶5-10; Ex. 2012.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

4

Layout Label and Filename Are Near Identical



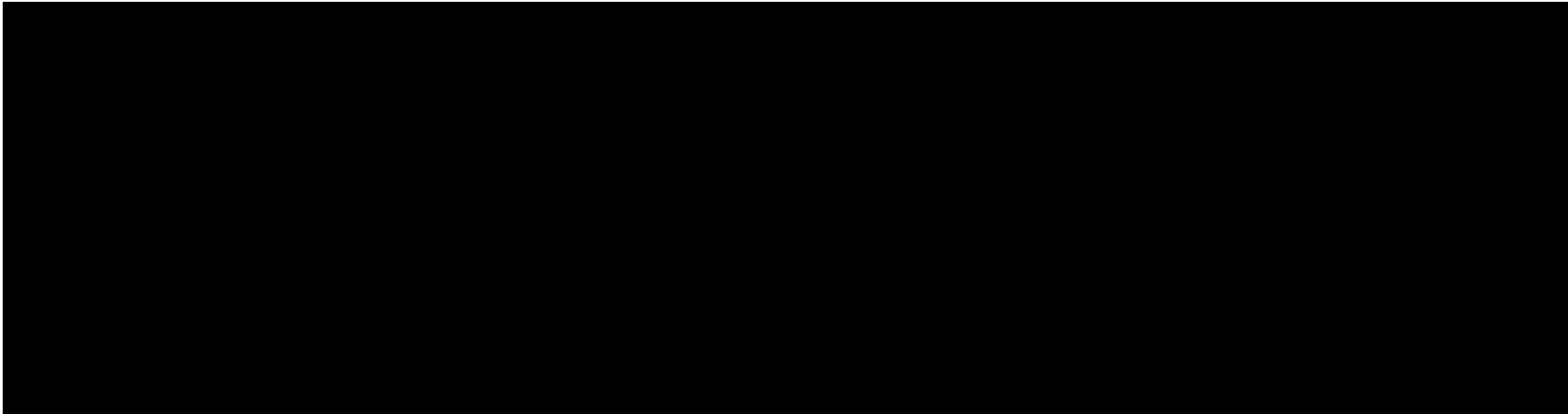
Sur-Reply, 19; Ex. 2016, ¶¶5-10;
Ex. 2012.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

5

Conception

Sorrells' Testimony:



Conception

Sorrells' Testimony:

14. As can be seen below in the bottom right corner of the schematic (expanded below), it has a file name of [REDACTED] and date of January 20, 1998 on its face. It was our practice at the time to date our schematics with the actual date the schematic was created. This date is consistent with the time that the ParkerVision team and I were working on the schematic of the circuit board for the Eddie chip.

15. As can be seen below in the metadata from a Relativity database, the file [REDACTED] was last modified on February 26, 1998. This date is consistent with the time that the ParkerVision team and I were working on the schematic of the circuit board for the Eddie chip.

Conception

POR, 23-27; Ex. 2016, ¶¶13-15; Ex. 2011.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

8

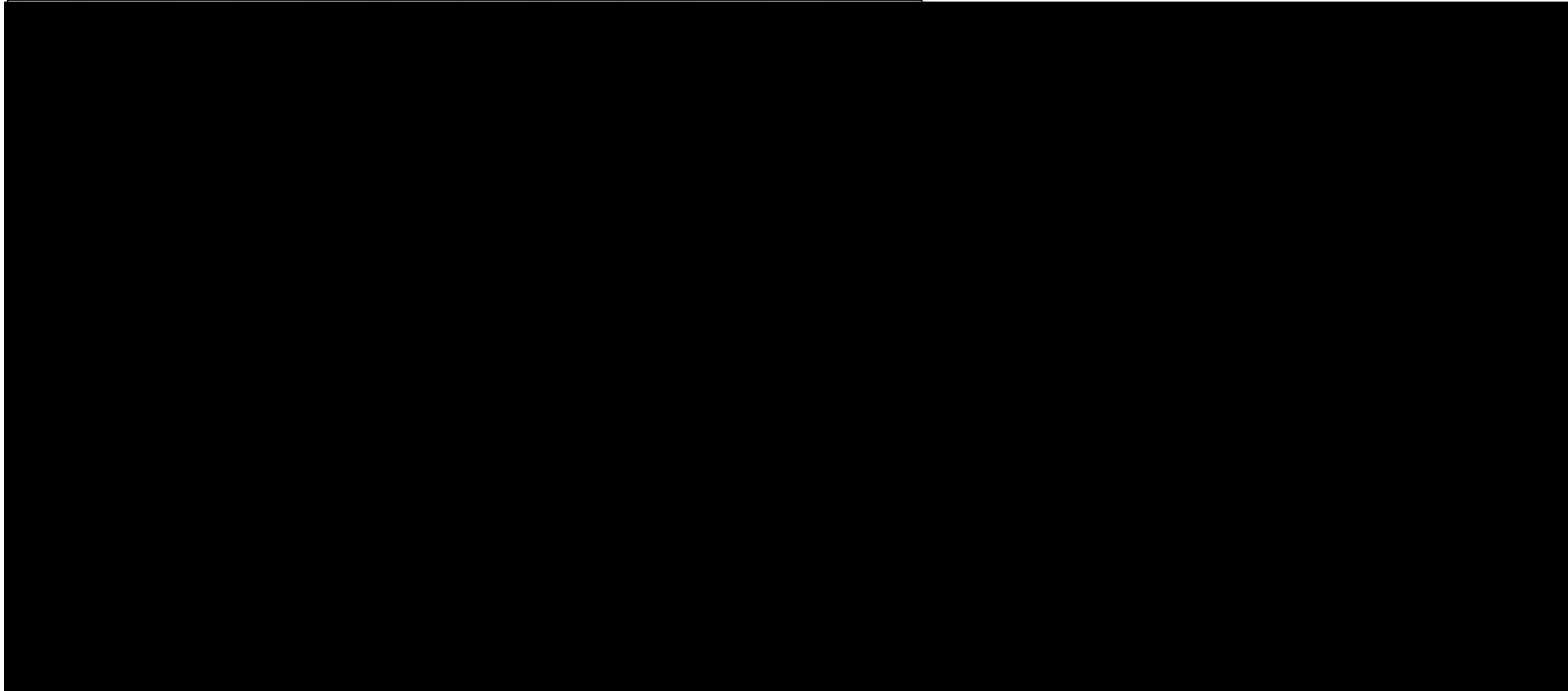
Conception

Sorrells' Testimony:

11. Below is a schematic of an early version of a circuit board (Exhibit 2014) that ParkerVision designed for mounting the Eddie chip.

12. As can be seen below in the bottom right corner of the schematic (expanded below), it has a date of August 21, 1997 on its face. It was our practice at the time to date our schematics with the actual date the schematic was created. This date is consistent with the time that the ParkerVision team and I were working on the schematic of an early circuit board for the Eddie chip.

Conception



POR, 23-27; Ex. 2016, ¶¶11-12; Ex. 2014.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

10

Conception

Sorrells' Testimony:

16. The layout of the circuit board (Exhibit 2013) can be seen below left and the schematic of the circuit board can be seen below right. Part 63 is shown both on the circuit board layout and schematic and represents the location of the Eddie chip on the circuit board. The layout of the circuit board was created in 1997.

Conception

POR, 23-27; Ex. 2016, ¶16; Exs. 2011, 2013. DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

12

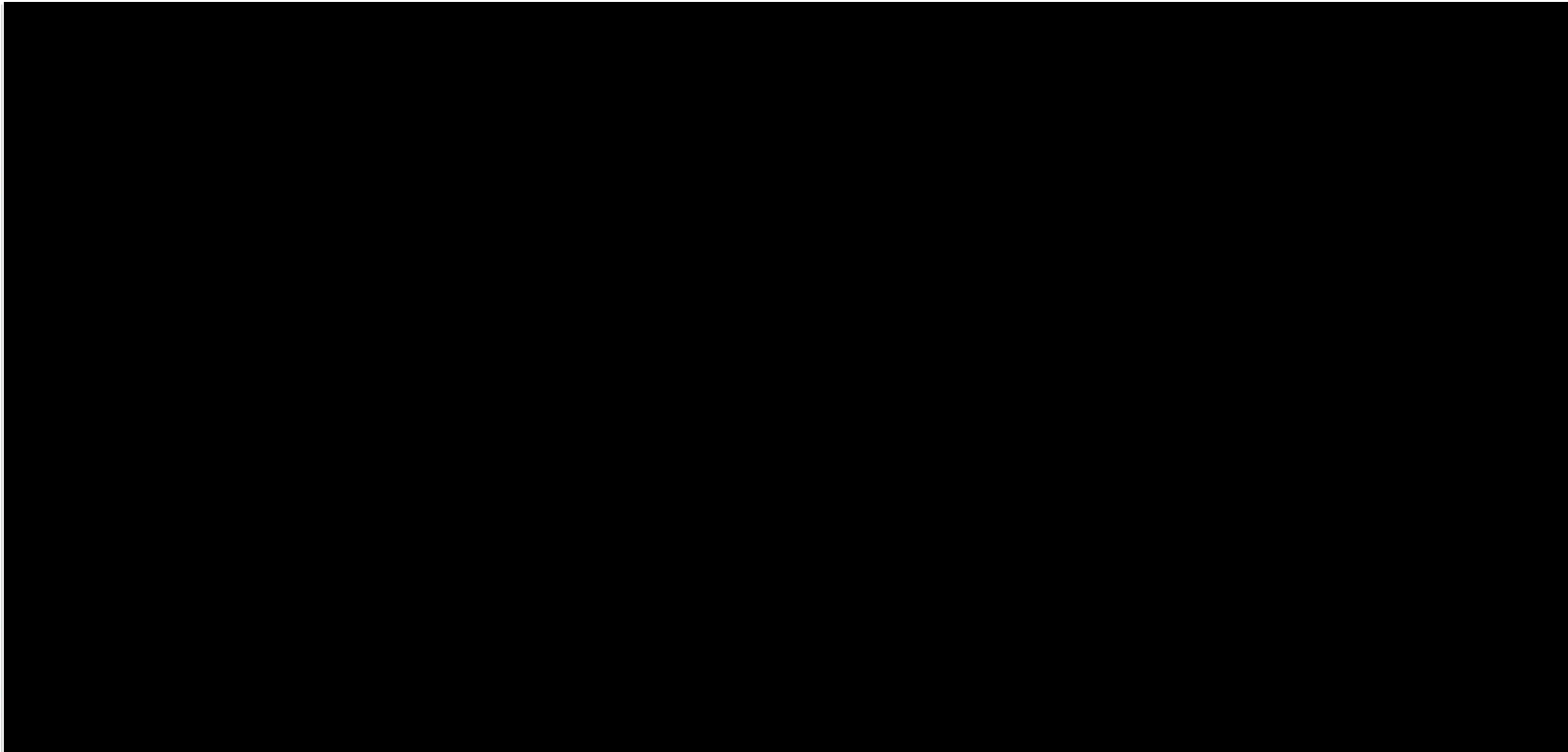
Conception

Sorrells' Testimony:

26. Below is an annotated version of the Eddie chip layout showing the the correspondence between the connections on the layout (below left) and the connections on the schematic of the circuit board (expanded below right). The



Conception



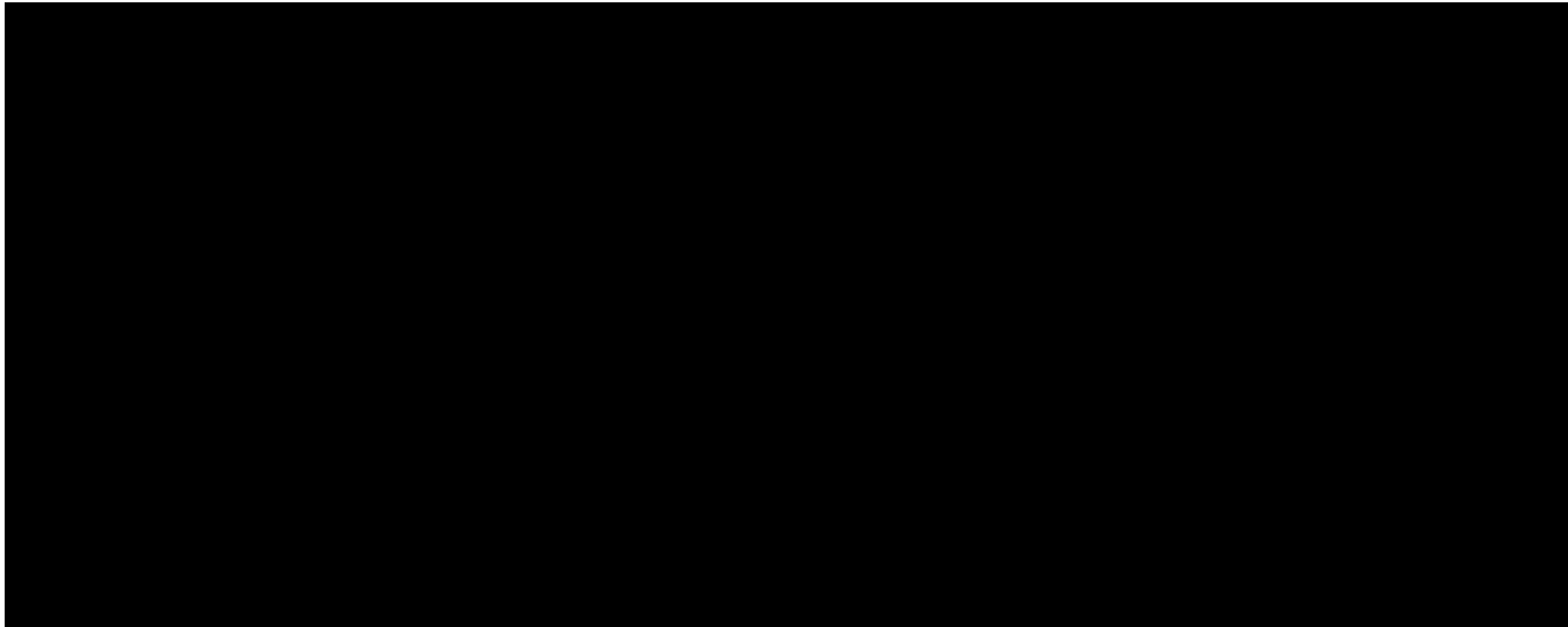
Conception

Sorrells' Testimony:

5. In the summer of 1996, ParkerVision began to design its first integrated circuit (IC) chip called "Eddie." ParkerVision completed the design of the Eddie chip by early 1997. The Eddie chip used [REDACTED]

[REDACTED]

Conception

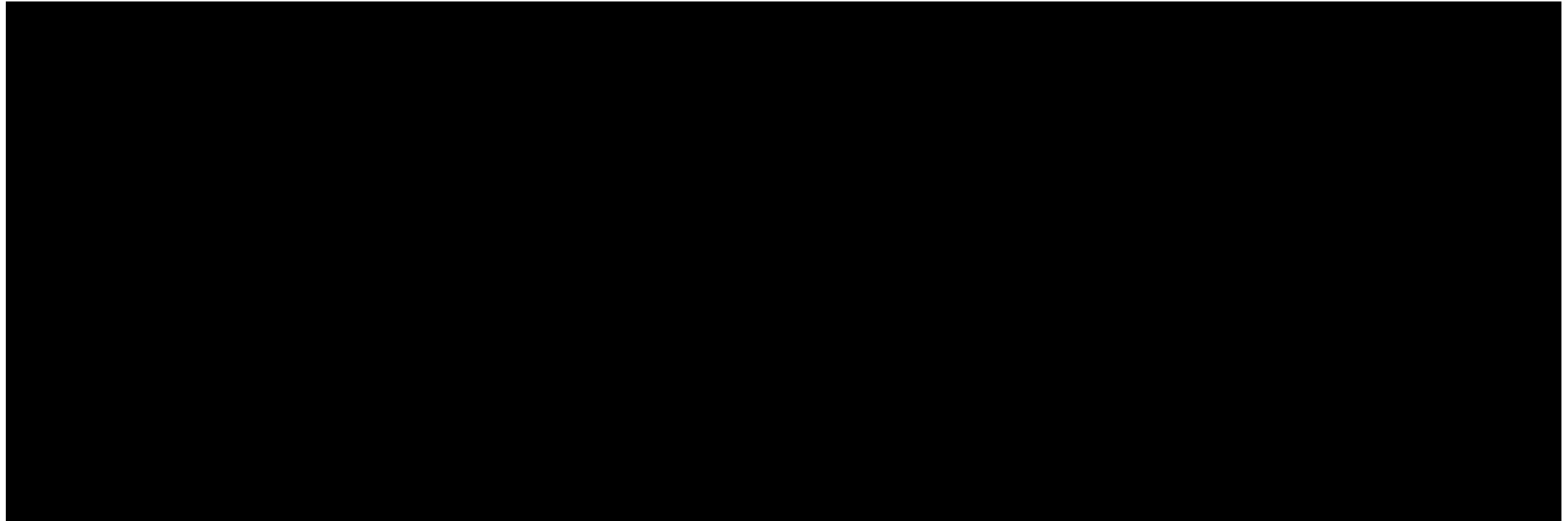


POR, 34; Sur-Reply, 19; Ex. 2015, 13-14.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

16

Conception/Reduction to Practice



Sur-Reply, 19; Ex. 2016, ¶15; Exs. 2010, 2012, 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

17

Eddie Device Uses a 50% Duty Cycle LO

'551 Patent:

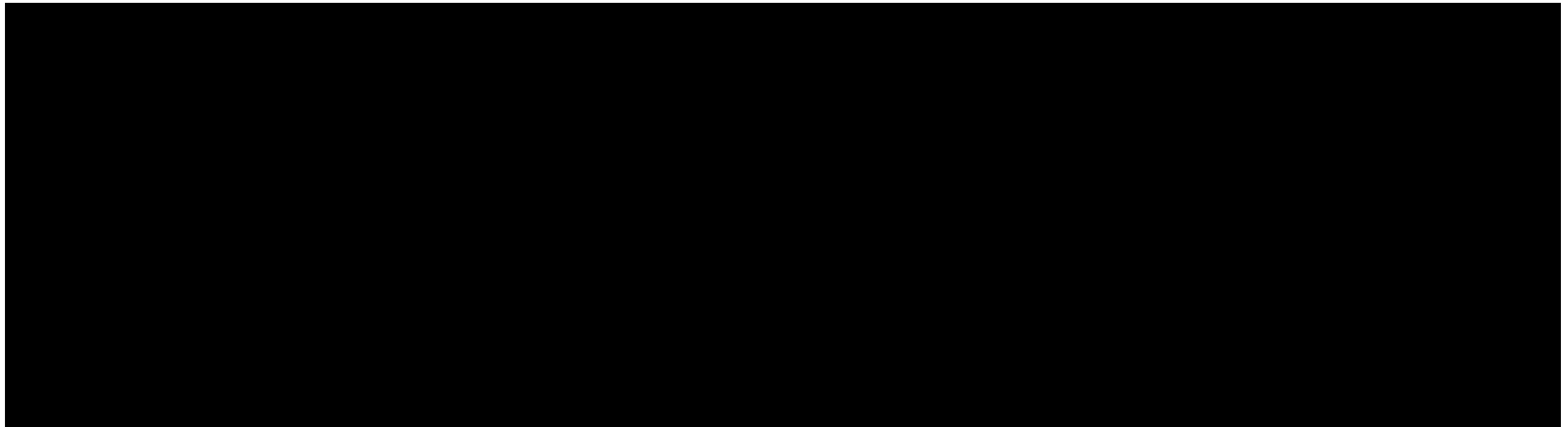
Thus, the apertures 4701 can be approximately $\frac{1}{10}$, $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, etc., or any other fraction of the period of the EM signal. Alternatively, the apertures 4701

Conception/Reduction to Practice

Sorrells' Testimony:

17. In 1997, ParkerVision chose [REDACTED] as its foundry to build the Eddie chip. The [REDACTED] agreement is shown in Exhibit 2027.
18. By no later than the first quarter of 1998, [REDACTED] provided ParkerVision with a fabricated Eddie chip using [REDACTED]
- [REDACTED]

Conception/Reduction to Practice



Reduction to Practice

Sorrells' Testimony:

20. By the first quarter of 1998, ParkerVision tested and evaluated the combined Eddie chip and circuit board. By the first quarter of 1998, ParkerVision issued press releases discussing testing/evaluation of the Eddie chip including the [REDACTED]. Ex. 2019, Ex. 2020.

21. The dates of the press releases are consistent with my recollection of the date by when ParkerVision tested/evaluated the Eddie chip and circuit board. ParkerVision's internal testing/evaluation showed that the combined Eddie chip and circuit board worked for its intended purpose of down-converting an RF signal.

POR, 23-27; Ex. 2016, ¶¶20-21;
Exs. 2019, 2020.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

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Reduction to Practice

FOR IMMEDIATE RELEASE

DECEMBER 10, 1997

Contact: Jeffrey Parker
President and CEO

ParkerVision Announces Breakthrough in Wireless Radio Frequency Technology

Company Invents the First Universal Direct Conversion Receiver IC's

Low Cost/High Performance RF Receiver Chips Now Available

The first generation of the technology has been incorporated into an integrated circuit (IC) which has been code named "Eddie".

Reduction to Practice

FOR IMMEDIATE RELEASE

Contact: Carolyn Wrenn
Director of Investor Relations

LABORATORY TESTS VERIFY PARKERVISION WIRELESS TECHNOLOGY

**- Testing Confirms The Ability to Create Single Chip High Performance/Low Cost RF
Receivers -**

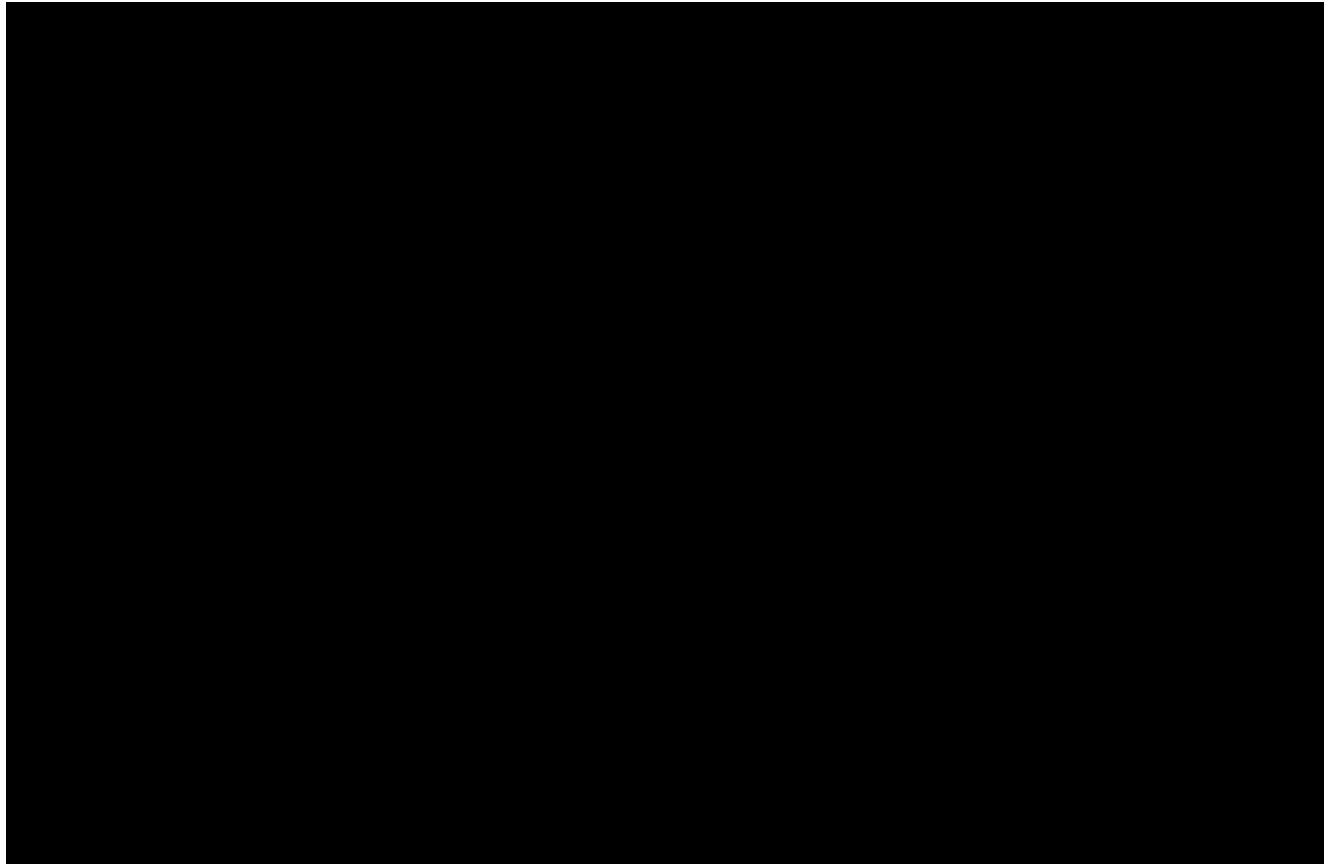
JACKSONVILLE, FLORIDA, **March 3, 1998**—PARKERVISION, INC. (NASDAQ NM SYMBOL PRKR), today announced that **The Boeing Company has completed a series of test measurements** for ParkerVision's recently announced Universal Direct Conversion Receiver and its first integrated circuit (IC) which has been code-named **'Eddie'**. ParkerVision said that the Boeing tests and those performed by ParkerVision internally are in accord.

Reduction to Practice

Sorrells' Testimony:

22. By the first quarter of 1998, ParkerVision sent the combined Eddie chip and circuit board to be tested by an independent testing company – [REDACTED] – to verify the performance of the combined Eddie chip and circuit board discussed above. ParkerVision and [REDACTED] entered into an agreement. Exhibit 2021. Boeing conducted tests in at least February and April 1998. Some testing notes and pictures from [REDACTED] test are shown in Exhibit 2022. I was present and observed some of the testing.

Reduction to Practice

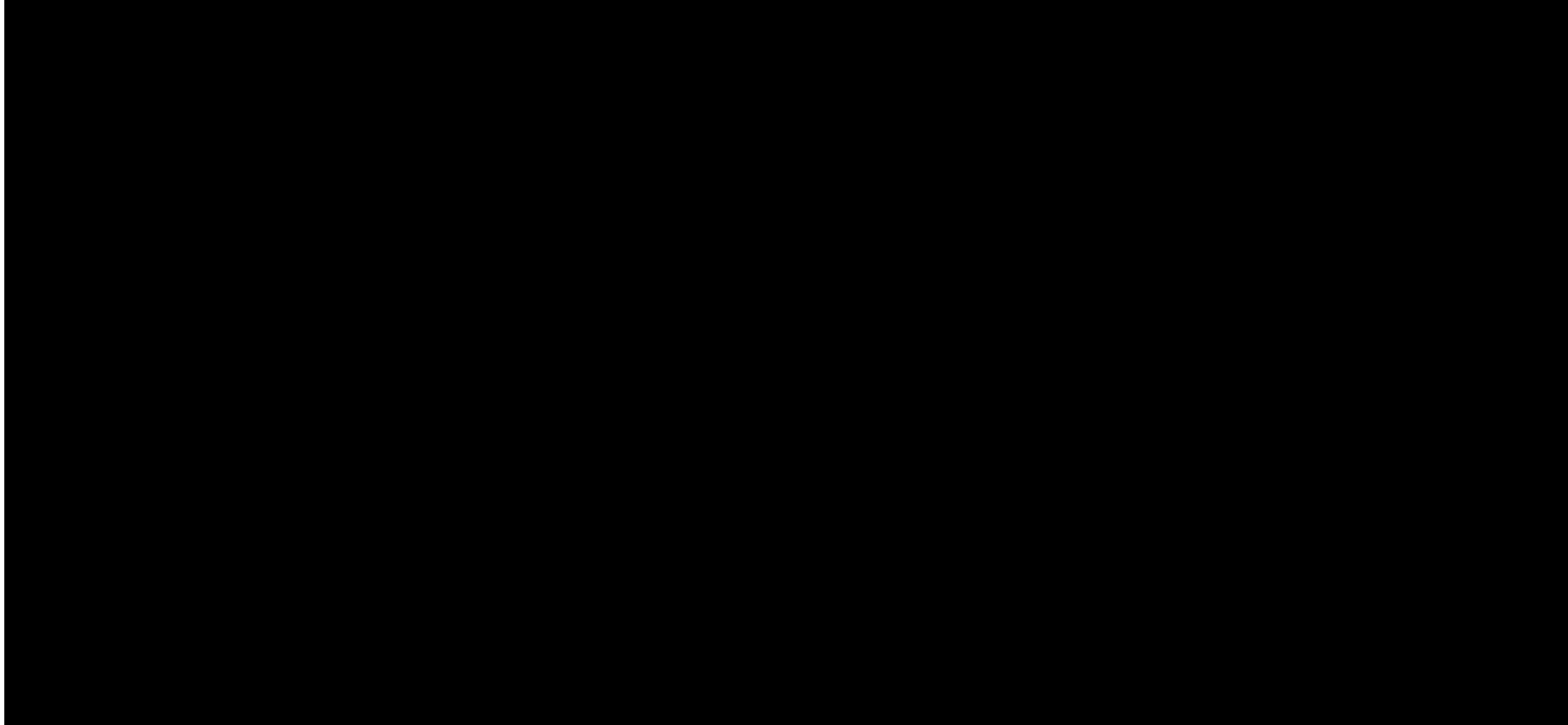


POR, 23-27; Ex. 2016, ¶22; Ex. 2021.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

25

Reduction to Practice



POR, 23-27; Ex. 2016, ¶¶23-24; Ex. 2010.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

26

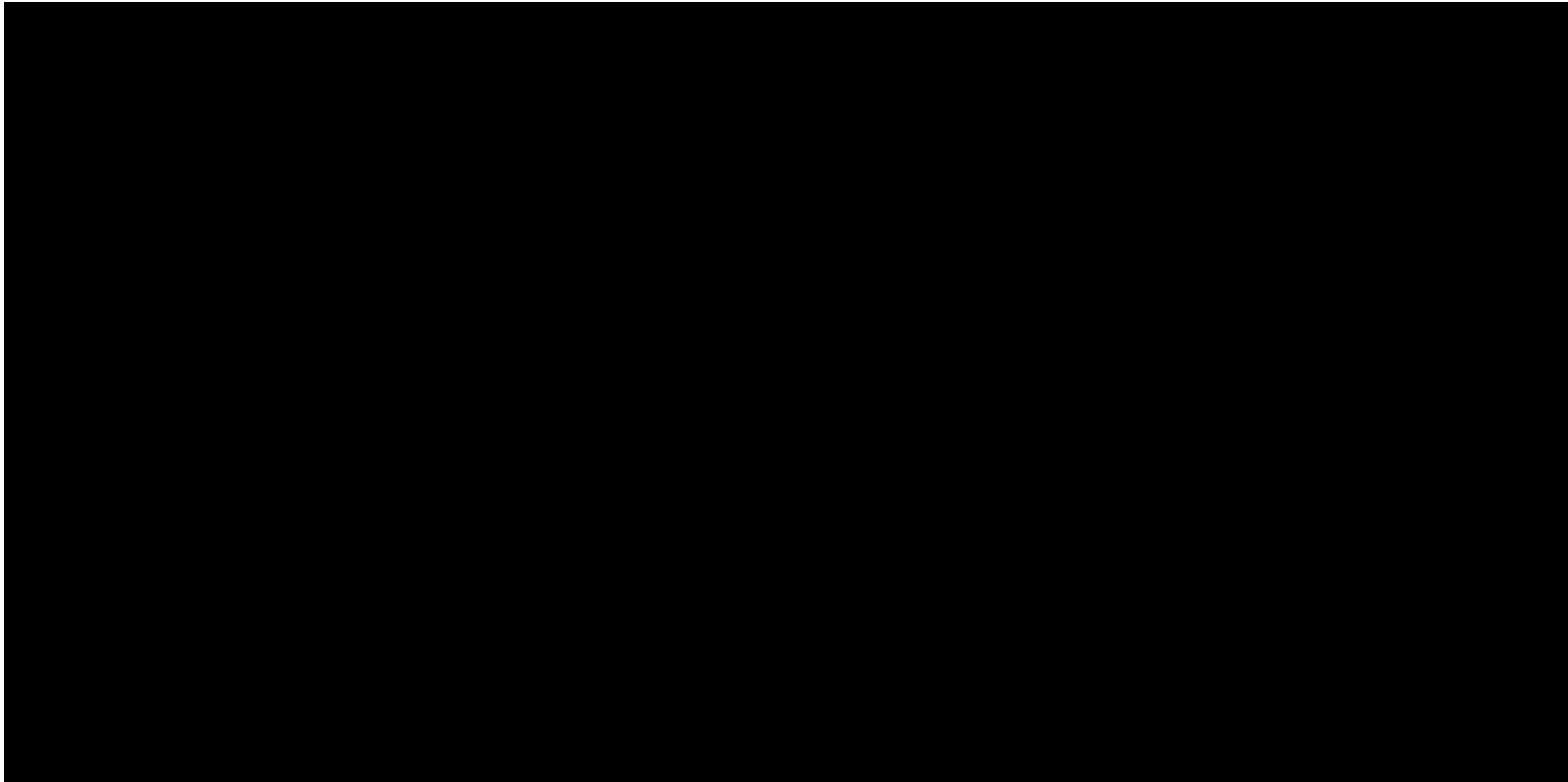
Reduction to Practice

Sorrells' Testimony:

23. The test report that [REDACTED] provided to ParkerVision is dated April 1998 (Exhibit 2010). The report shows the testing that was performed. This date is consistent with the time that I had the Eddie chip and circuit board sent to [REDACTED] for testing.

24. The test results confirmed the performance of the Eddie chip and circuit board. The [REDACTED] report confirmed ParkerVision's testing/evaluation and also showed that the combined Eddie chip and circuit board worked for its intended purpose of down-converting an RF signal.

Reduction to Practice



POR, 23-27; Sur-Reply, 17-18; Exs. 2010- 2011. DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

28

Reduction to Practice

Sorrells' Testimony:

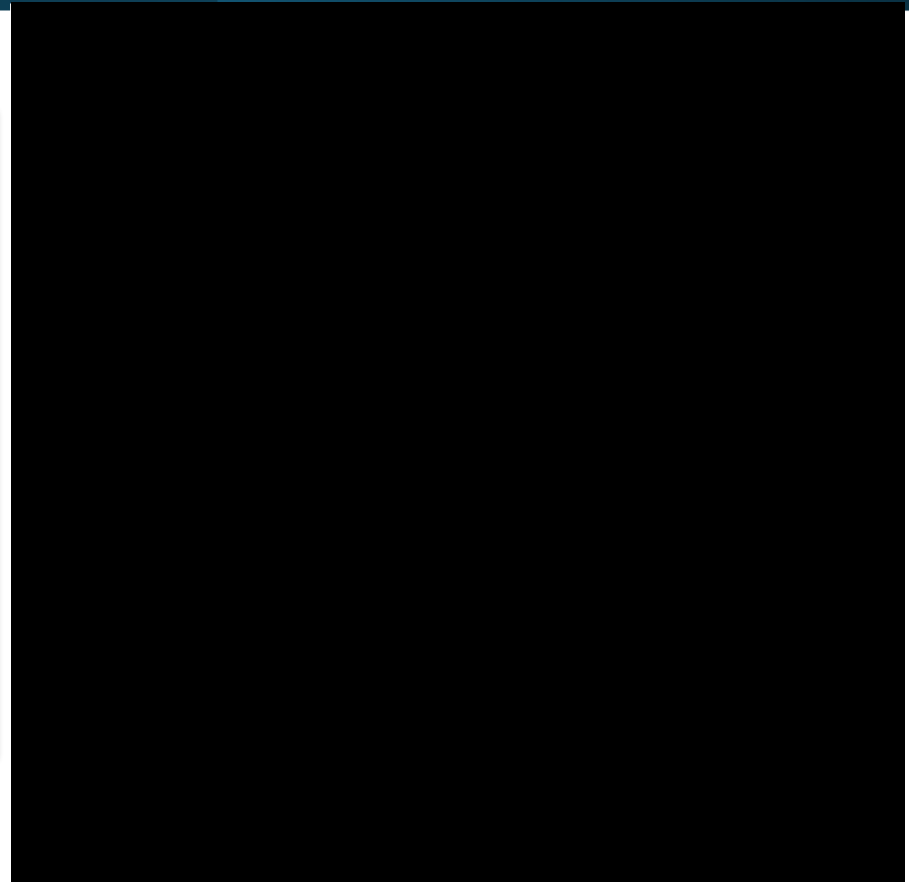
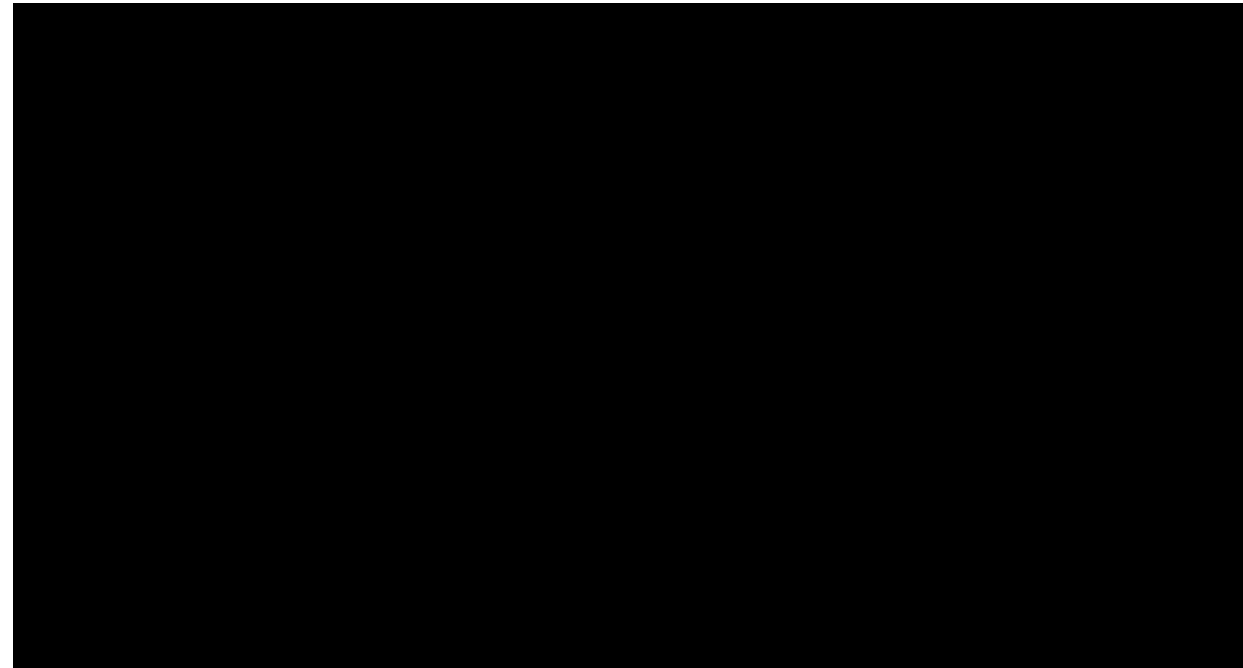
7. The layout of the first Eddie chip can be found in a file [REDACTED] (Exhibit 2012).

11. Below is a schematic of an early version of a circuit board (Exhibit 2014) that ParkerVision designed for mounting the Eddie chip.

13. As shown below, by January 20, 1998, ParkerVision designed the final schematic for a circuit board (Exhibit 2011) for mounting the Eddie chip. The schematic for the circuit board can be found in a file [REDACTED]

Reduction to Practice

Dickens' Admission:



POR,28; Reply, 7-8; Sur-Reply, 22; Ex.
2043,54:2-8; Ex.-2010,7-8.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

30

Diligence

Sorrells' Testimony:

28. From at least March 6, 1997 through the filing of U.S Patent No. 6,061,551 (from which the '177 patent claims priority) on October 21, 1998, ParkerVision employees worked consistently on the design, development, testing, and/or evaluation of the Eddie Chip. From at least January 20, 1998 through October 21, 1998, ParkerVision employees worked consistently on the design, development, testing, and/or evaluation of the Eddie Chip and the circuit board into which the Eddie chip was incorporated.

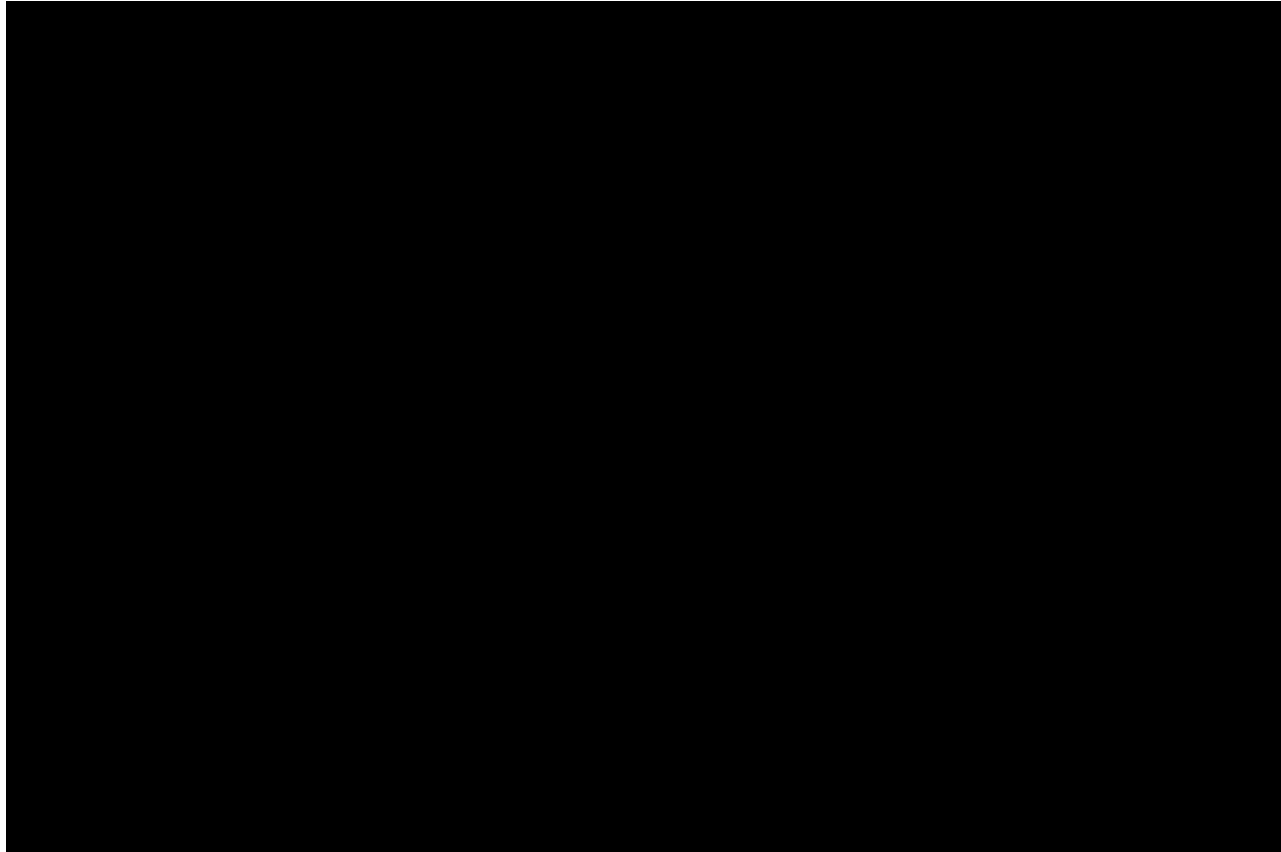
Diligence

Sorrells' Testimony:

29. ParkerVision files related to the design, development, testing, and/or evaluation of the Eddie chip and circuit board discussed above are maintained in a Relativity database. The Relativity database shows the metadata including file extension, file name, and last modified date of these files. A search of the database was run. Below is an excerpt from the search.

30. The results of the search were exported to a excel spreadsheet which is shown in Figure 2029. The files in the spreadsheet reflects ParkerVision's continuous work from at least January 1997 through October 1998 related to designing and developing the Eddie chip and circuit board.

Diligence



POR, 23-27; Ex. 2016, ¶¶29-30; Ex. 2029.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

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Sorrells' Deposition

REMOTE ORAL DEPOSITION OF

DAVID SORRELLS

Middleburg, Florida

May 23, 2025 - 9:02 a.m.

I know we haven't been going for very long, but can you give me ten minutes for a break, please.

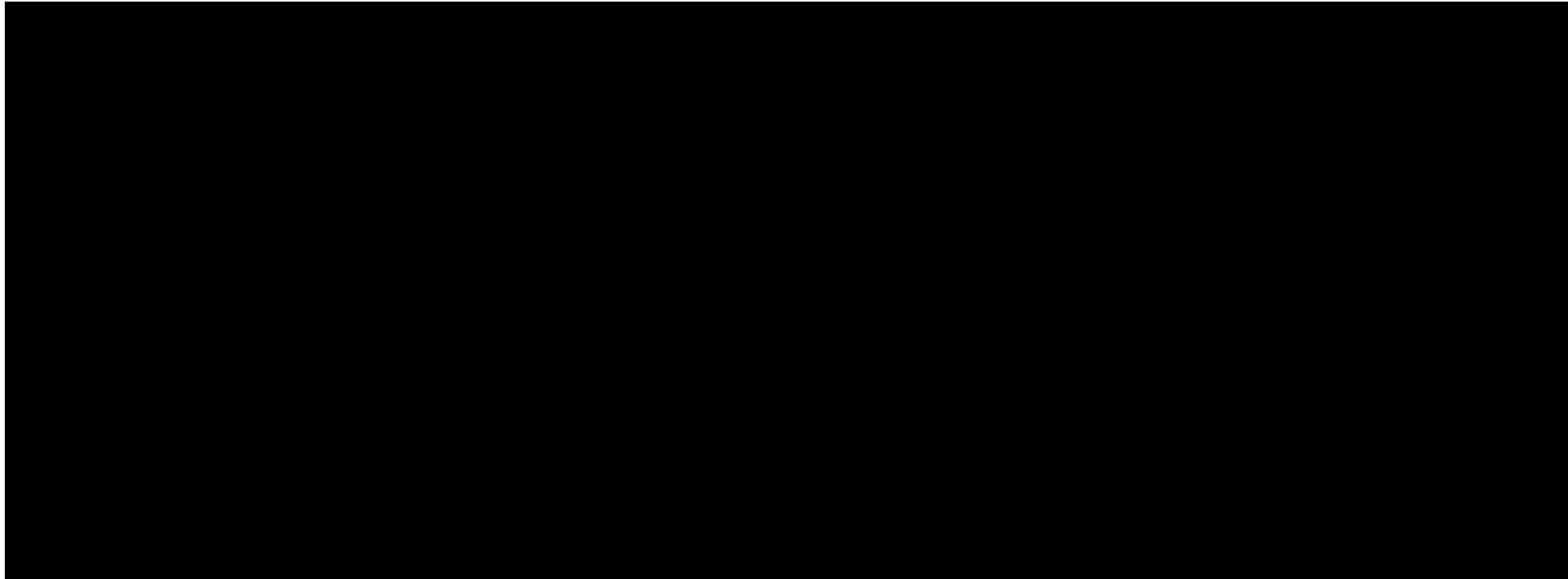
A. Sir, this is your deposition. And I'm, by the way, incredibly happy to be doing it remotely, so I'm on your schedule. record.

MS. LEPORE: That's fine with me as well.

(Recess taken from 9:34 a.m. to 9:47 a.m.)

MR. GRISWOLD: We have no further questions. We surrender the witness.

Different Versions of Files Have Different Names/Timestamps



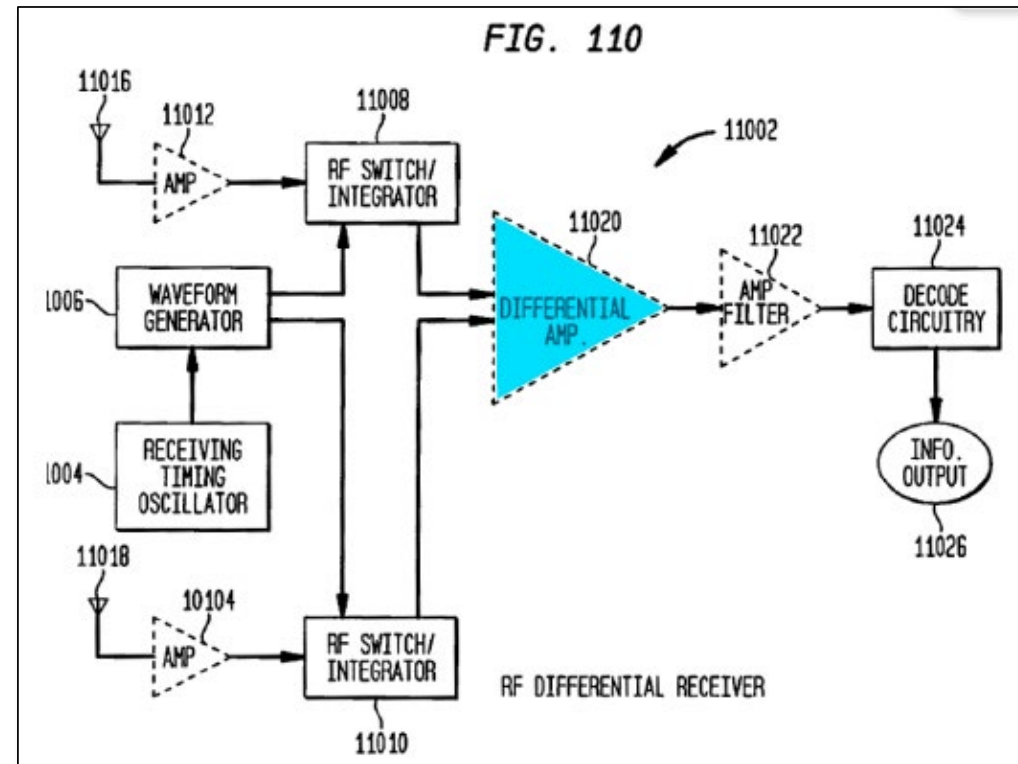
Reply, 4,6; Sur-Reply, 19; Ex. 2016,
¶¶5-10; Ex. 2012.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

35

Claims are Entitled to the Priority Date of the '551 Patent

'551 Patent:



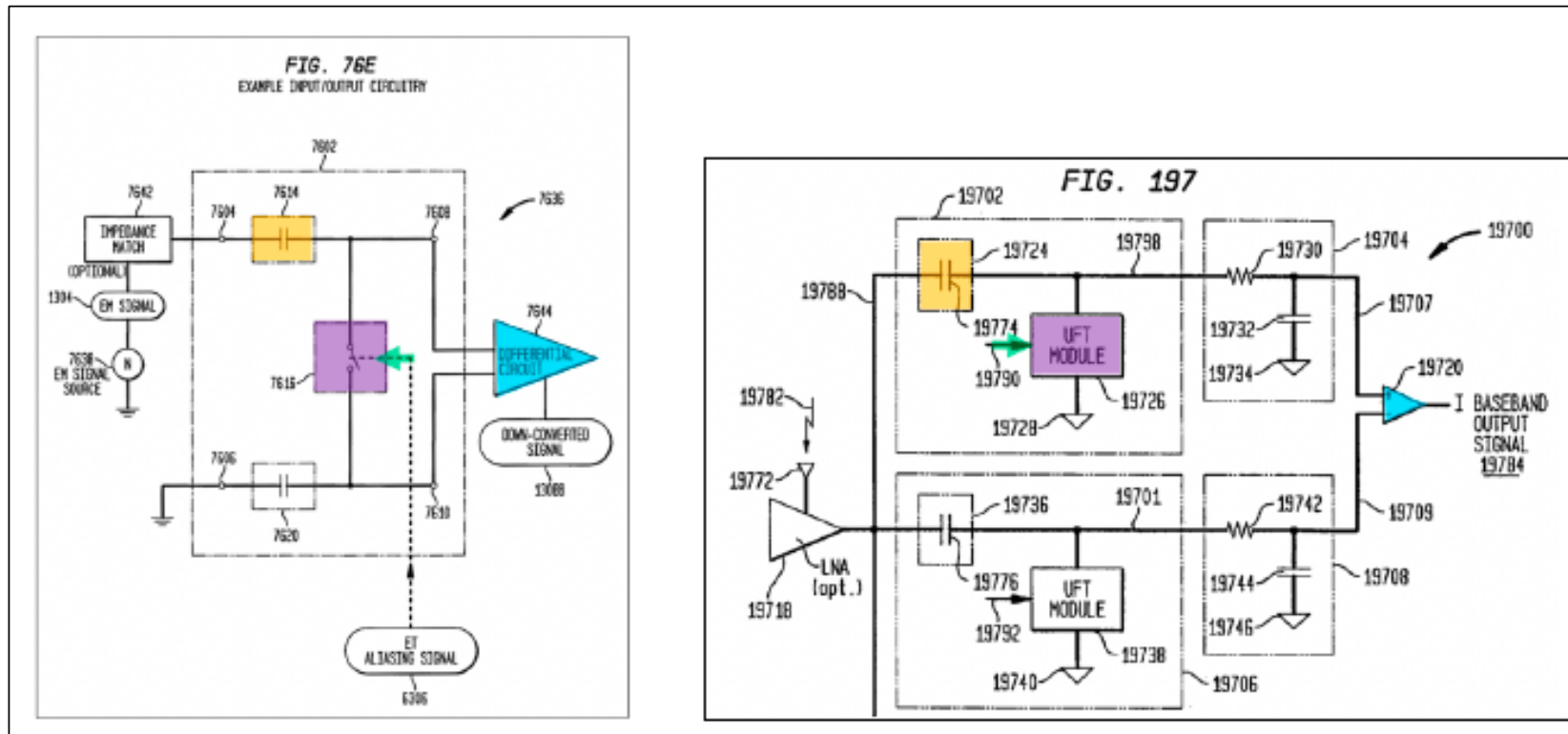
Reply, 18; Sur-Reply, 21-23; Ex.
2006,104:28-44, Figs. 110, 76E, 197.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

36

Claims are Entitled to the Priority Date of the '551 Patent

'551 Patent:



Sur-Reply, 22-23; Ex. 2006,104:28-44, Figs. 110, 76E, 197.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

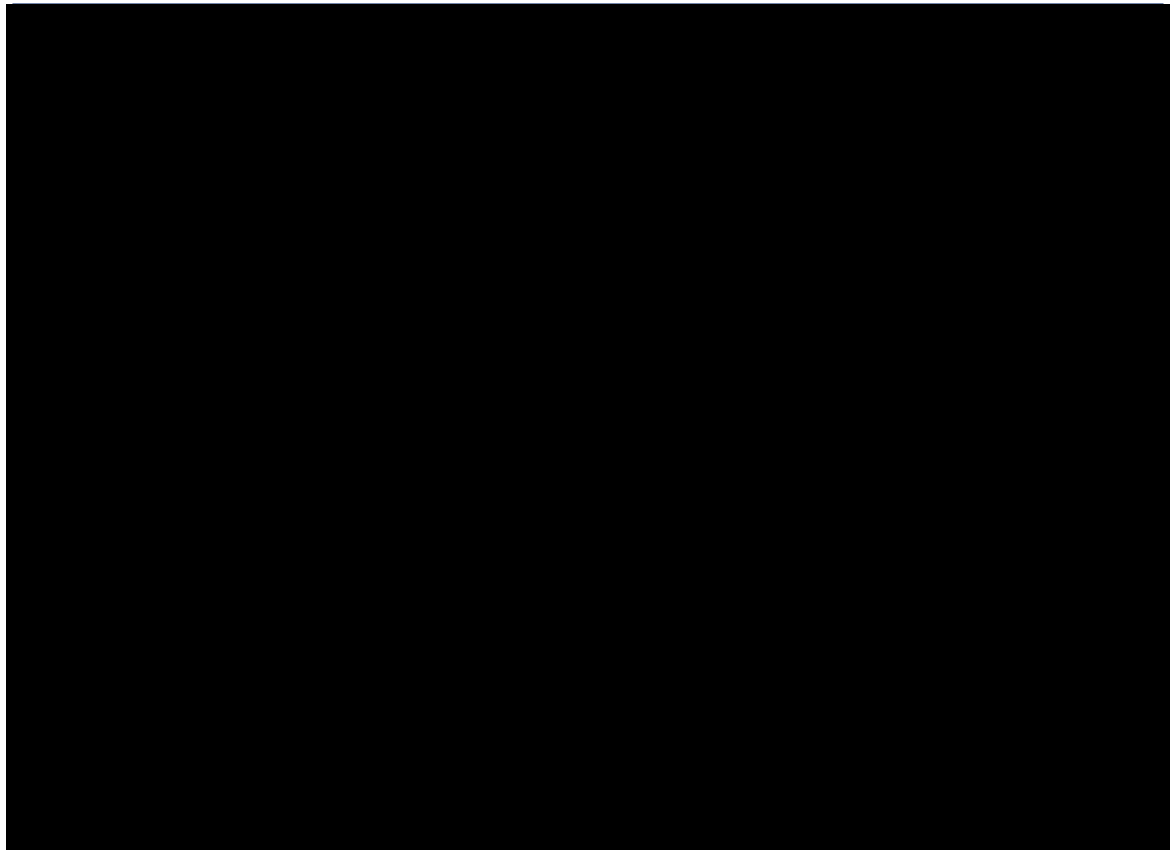
37

The Eddie Device Practices the Challenged Claims

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

38

Eddie Device Practices the Challenged Claims

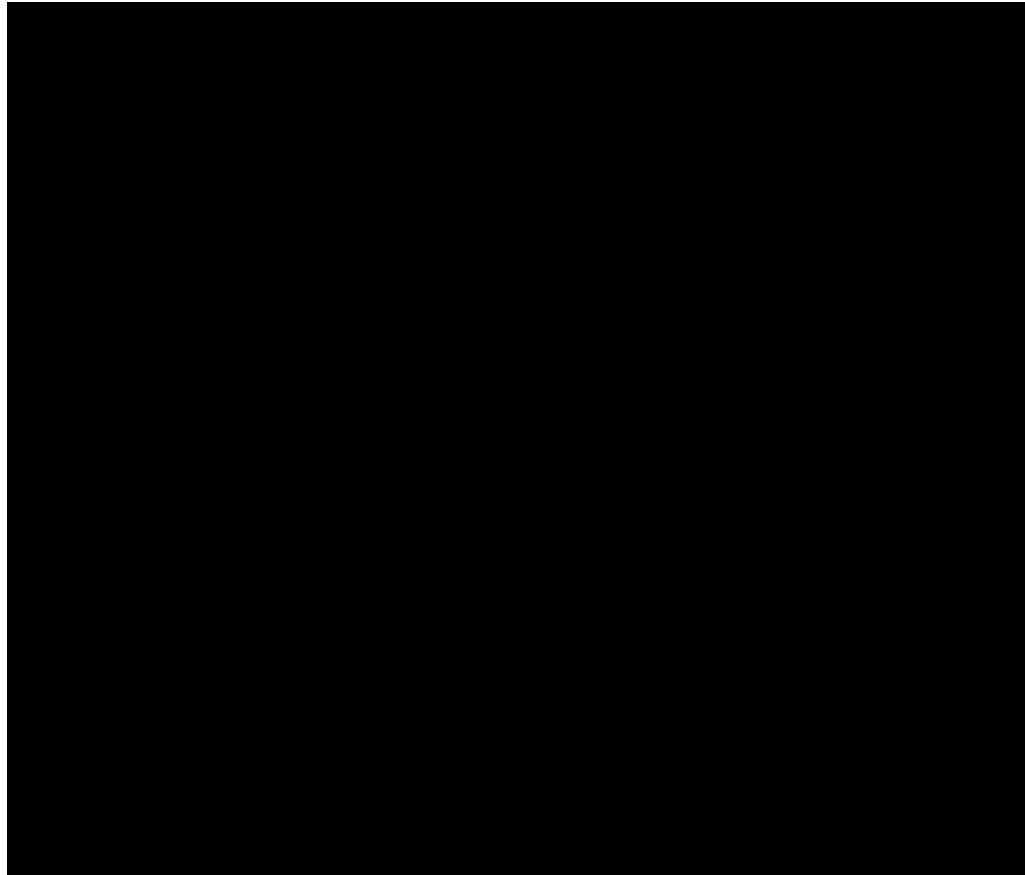


POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

39

Eddie Device Practices the Challenged Claims

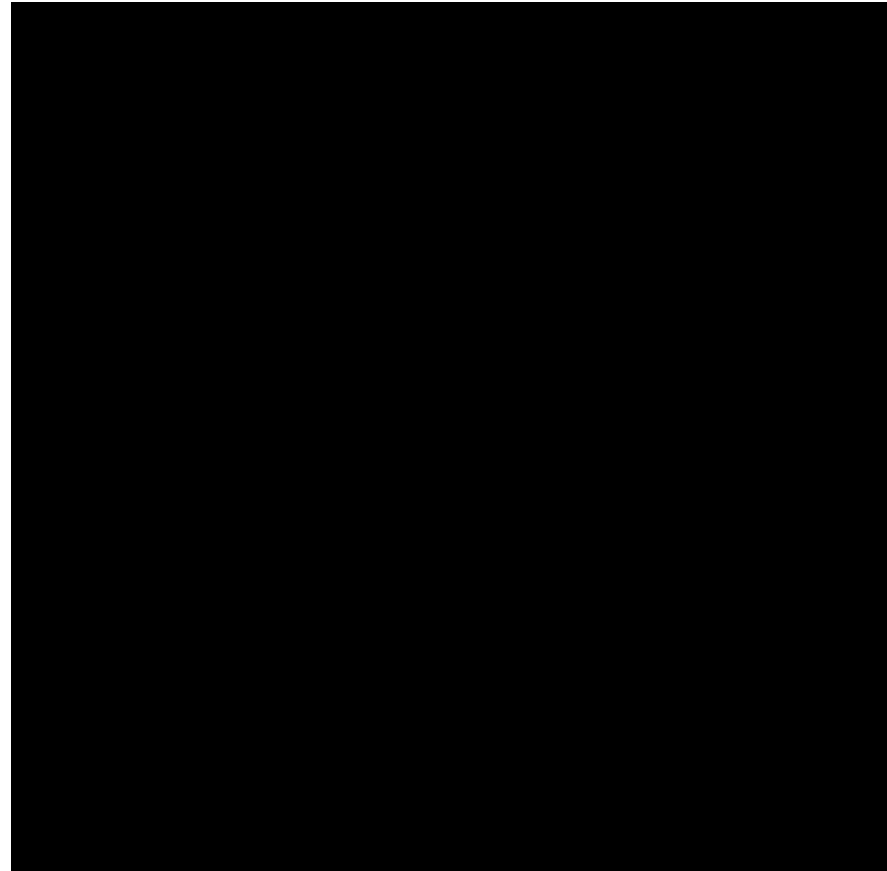


POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

40

Eddie Device Practices the Challenged Claims

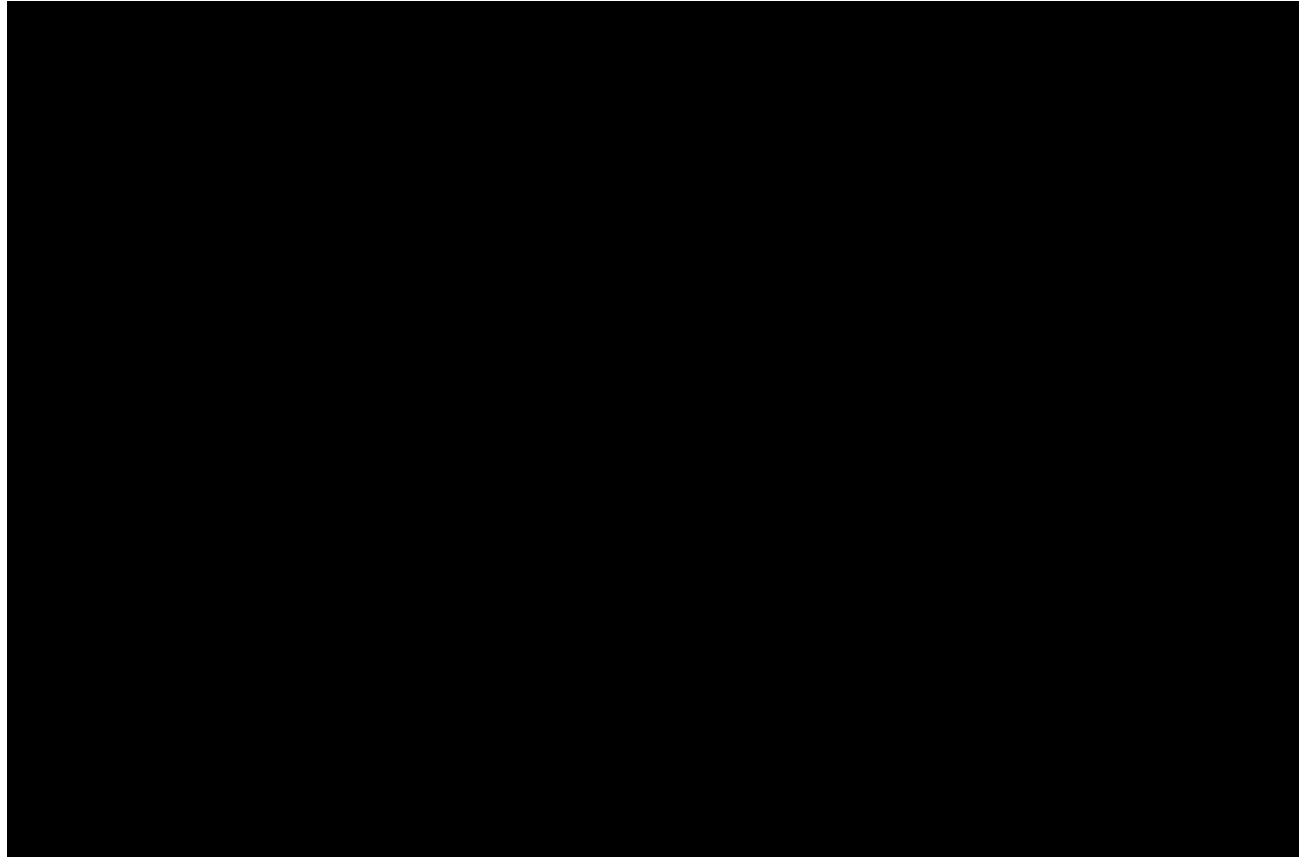


POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

41

Eddie Device Practices the Challenged Claims

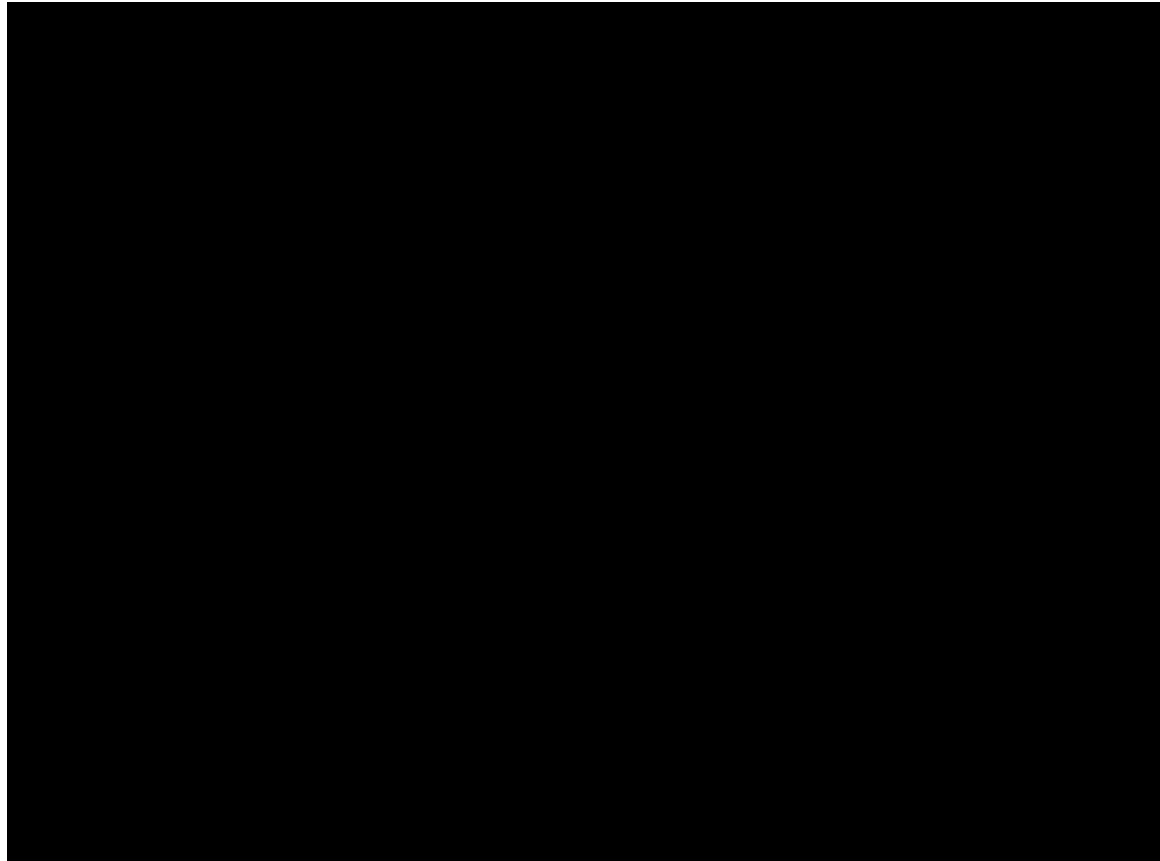


POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

42

Eddie Device Practices the Challenged Claims

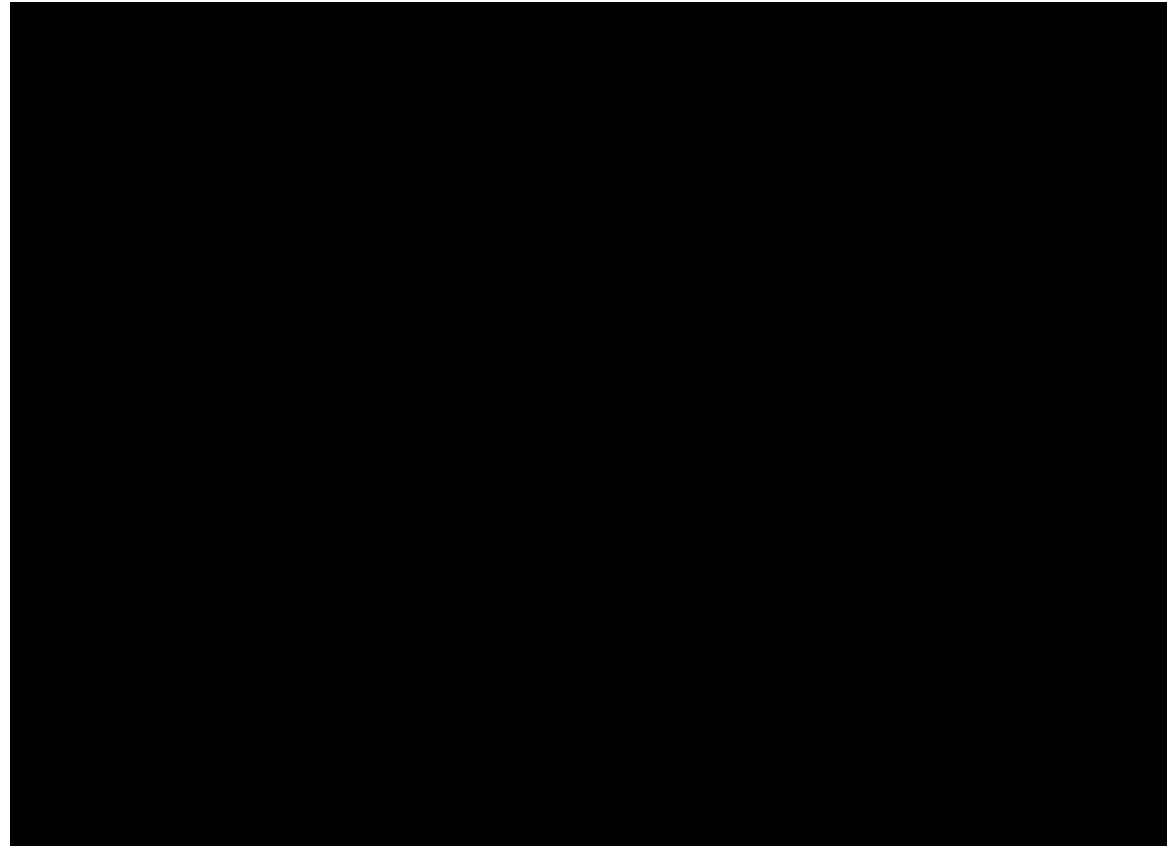


POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

43

Eddie Device Practices the Challenged Claims

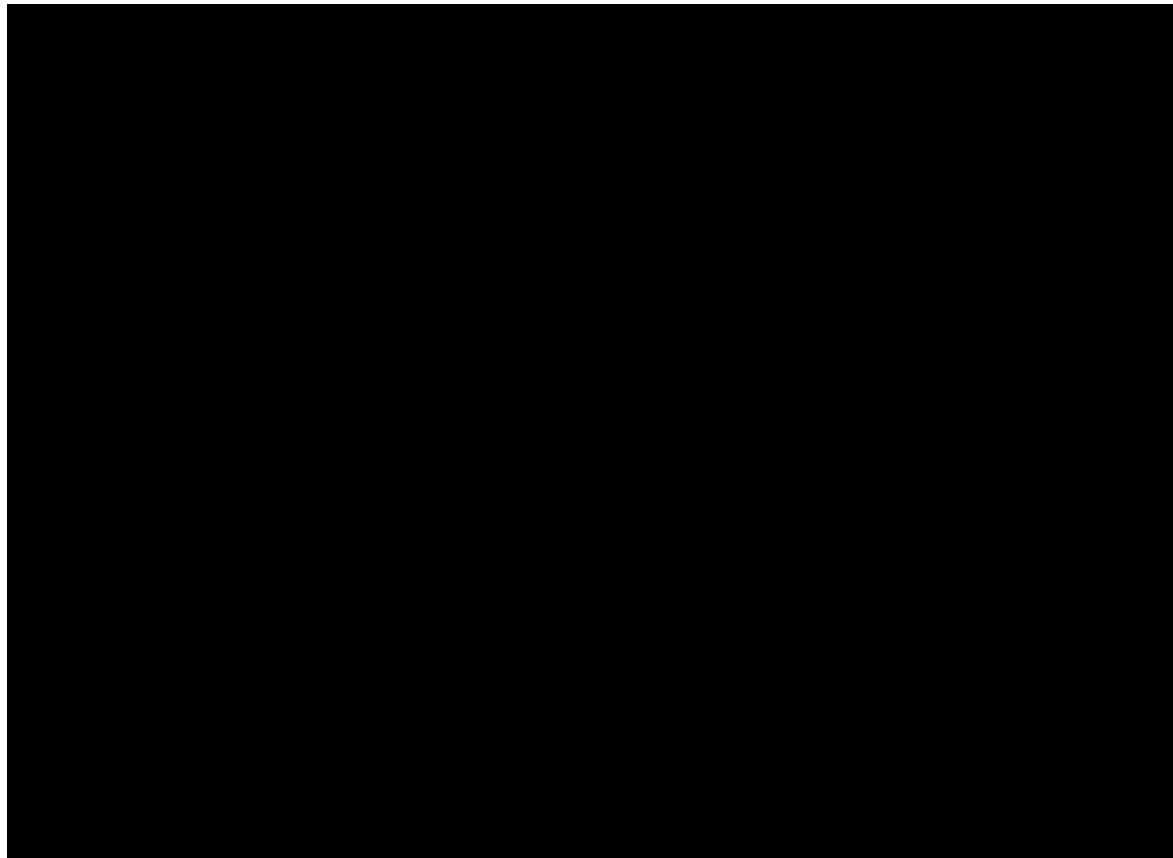


POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

44

Eddie Device Practices the Challenged Claims

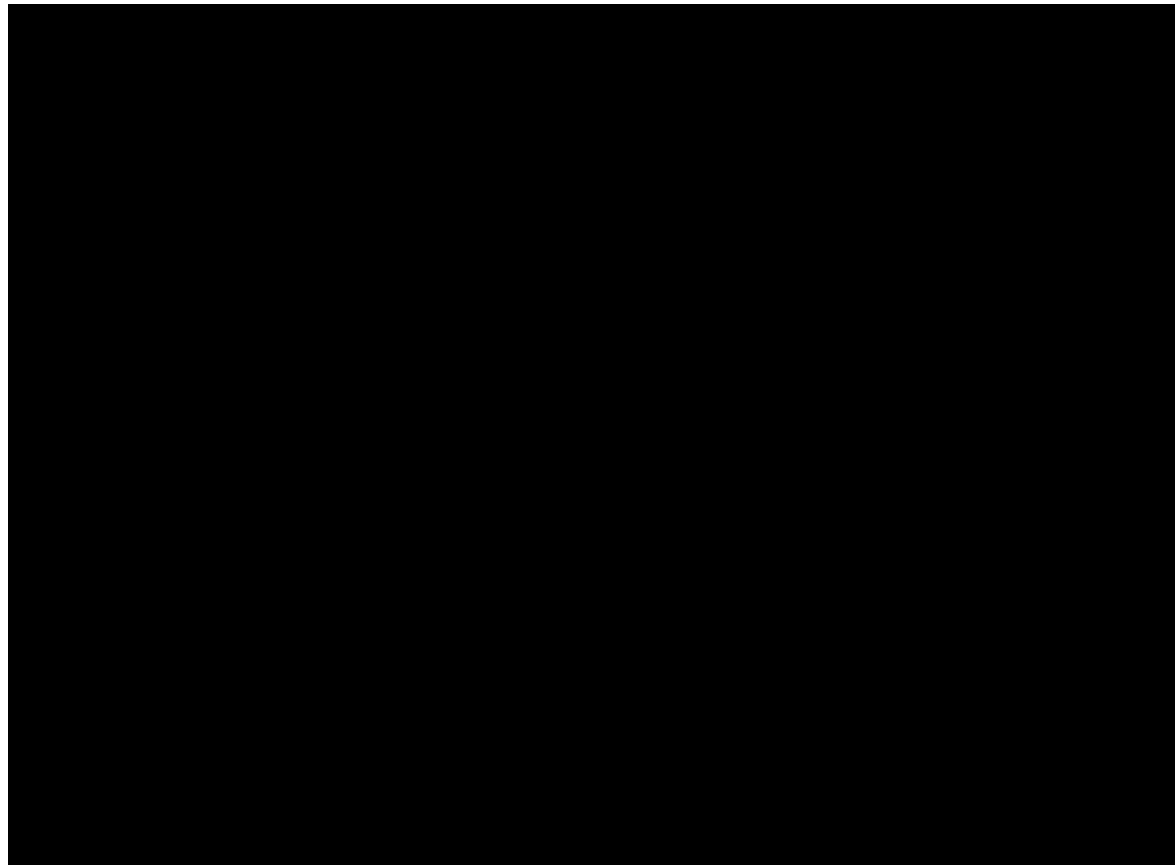


POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

45

Eddie Device Practices the Challenged Claims

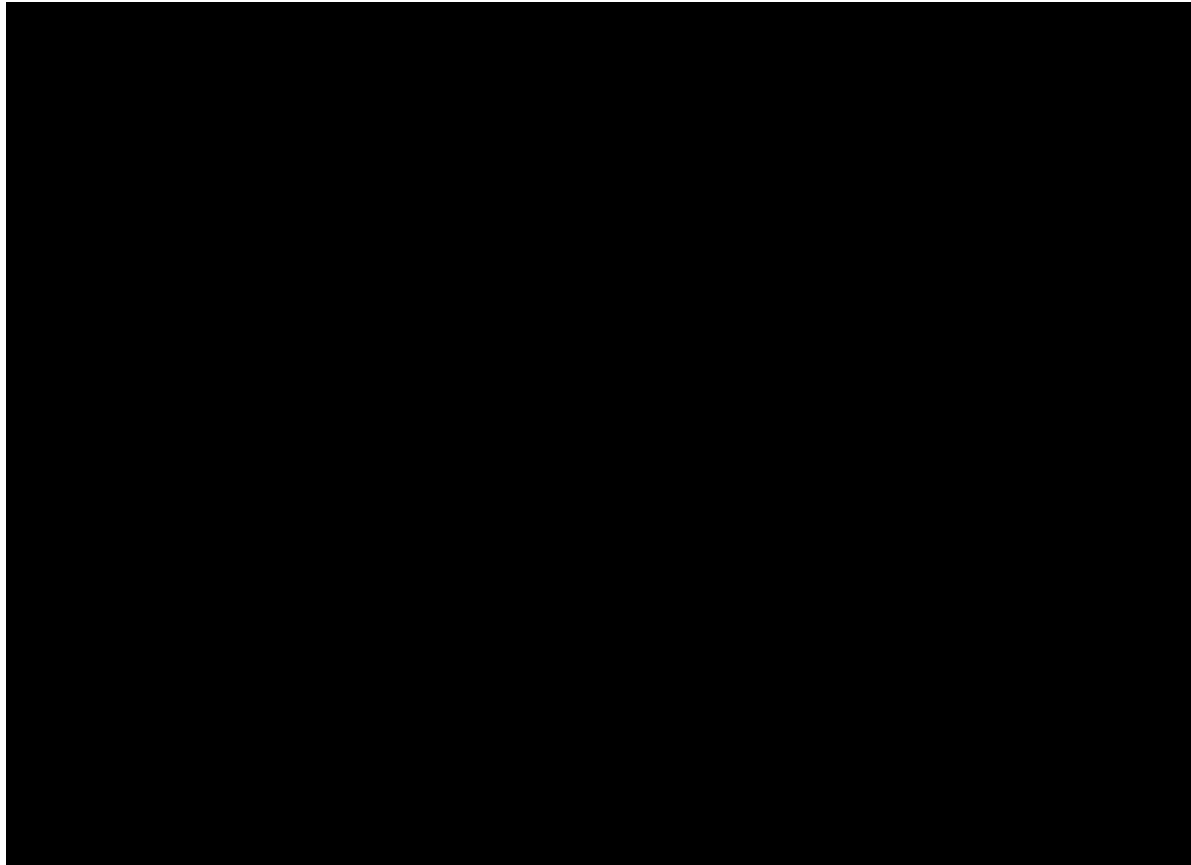


POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

46

Eddie Device Practices the Challenged Claims

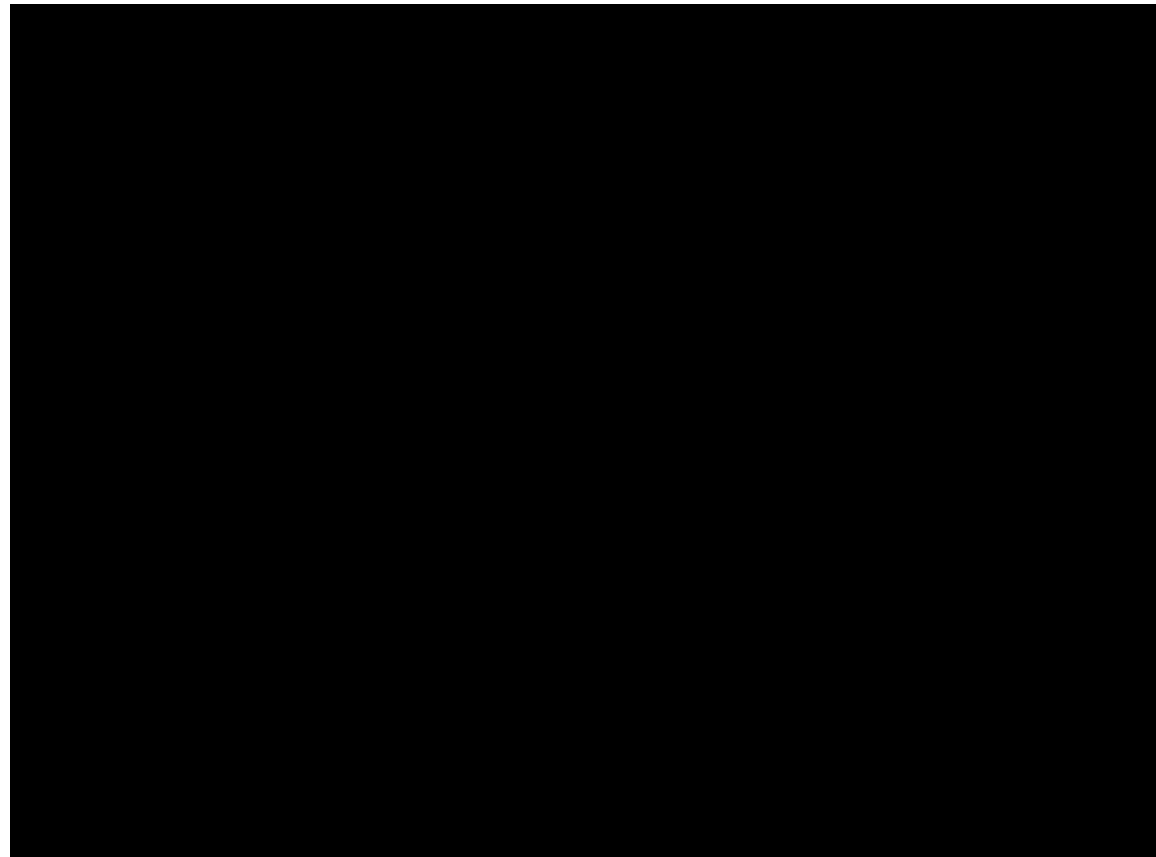


POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

47

Eddie Device Practices the Challenged Claims

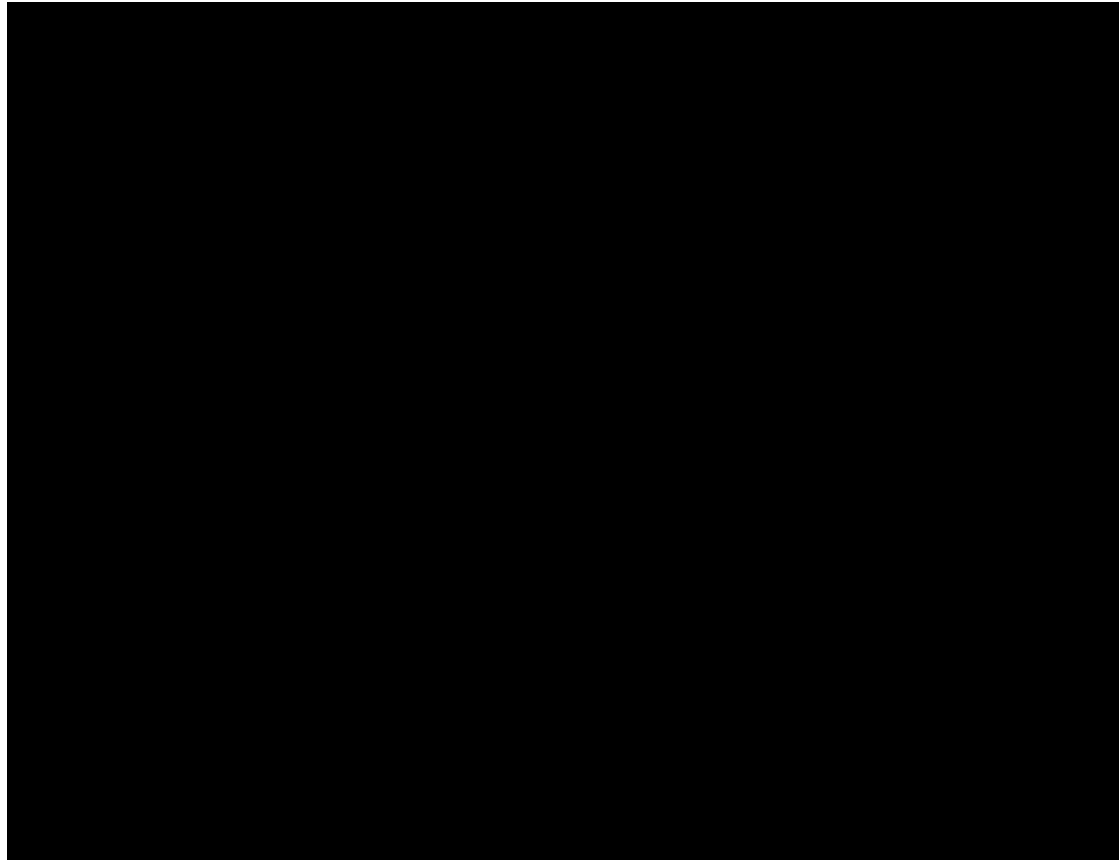


POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

48

Eddie Device Practices the Challenged Claims

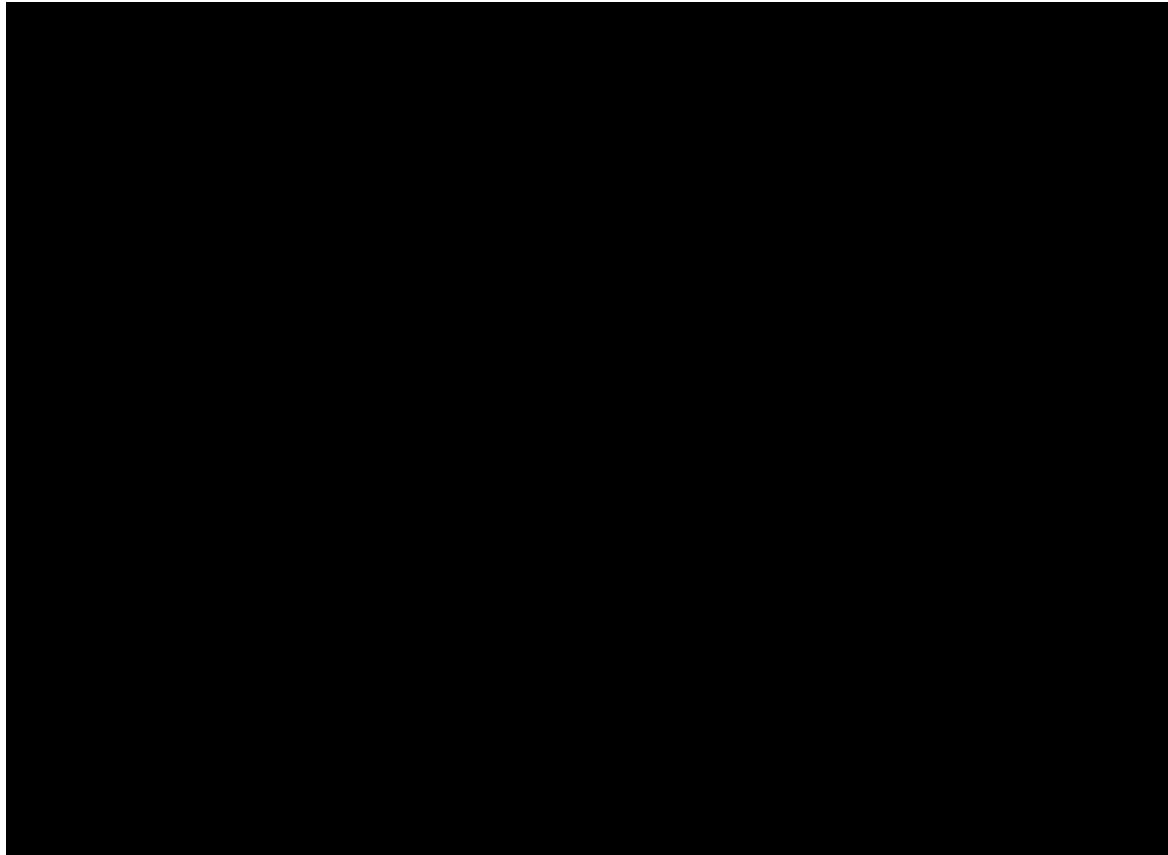


POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

49

Eddie Device Practices the Challenged Claims



POR, 27-51; Sur-Reply, 2-15; Ex. 2015.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

50

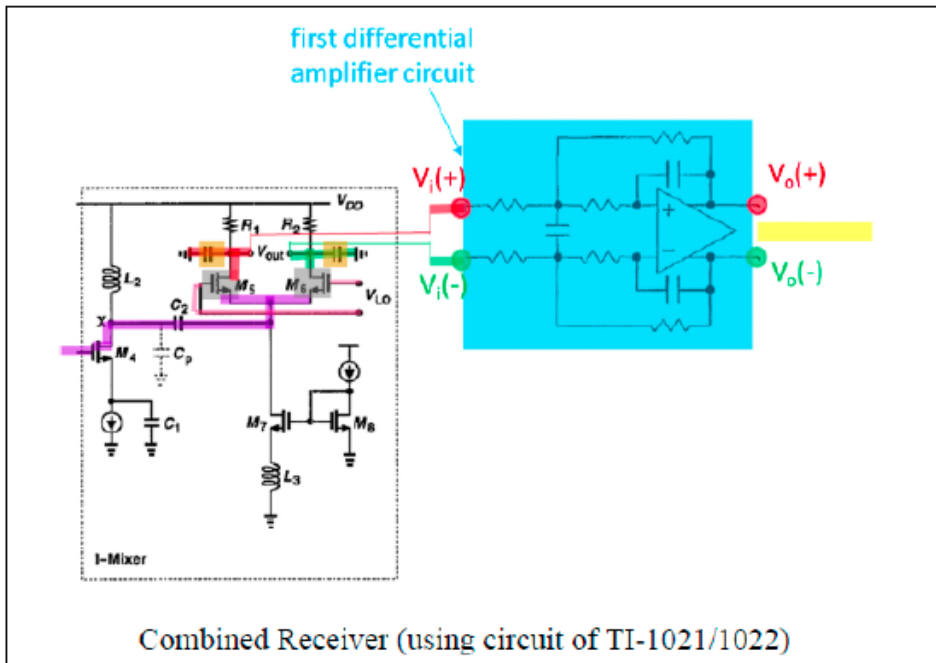
Petitioner's Experts Take Inconsistent Positions

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

51

Petitioner's Experts Take Inconsistent Positions

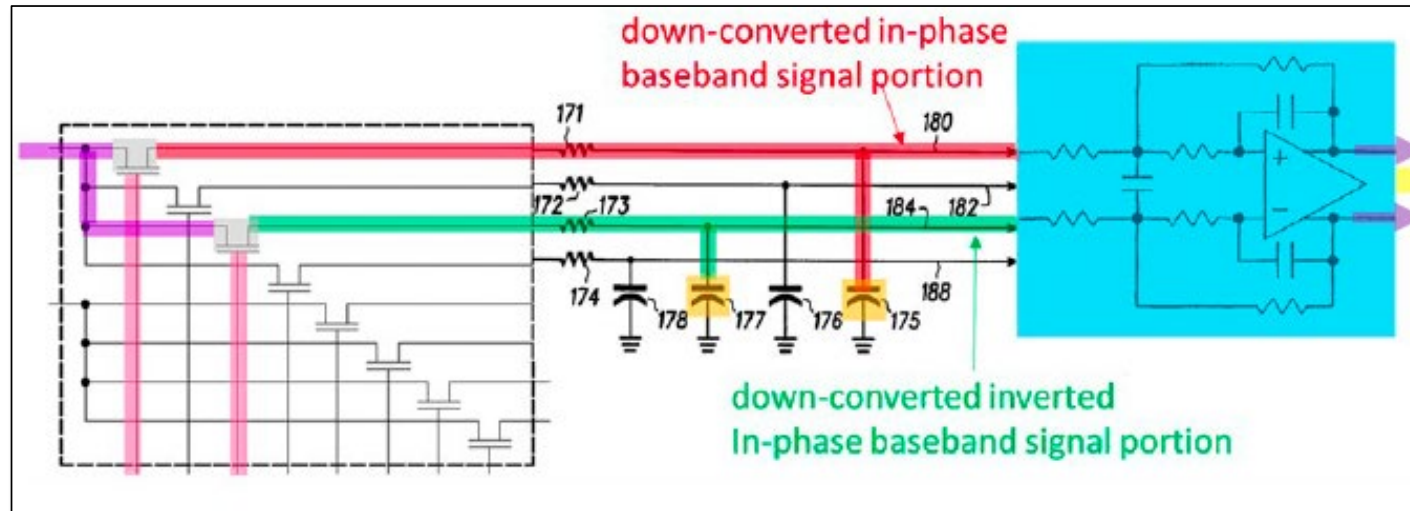
Galton:



246. The first differential amplifier circuit (light blue) combines the down-converted in-phase baseband signal portion (red portion) with the down-converted inverted in-phase baseband signal portion (green portion) because each of the two complementary signal components at the output (i.e., $V_o(+)$ and $V_o(-)$) is a result of both of the two complementary signal components at the input (i.e., $V_i(+)$ and $V_i(-)$). As illustrated. $V_o(+)$ = $A \cdot (V_i(+)$ - $V_{in-})/2$, and $V_o(-)$ = $-A \cdot (V_i(+)$ - $V_i(-))/2$, where A is the amplification factor. Thus, each of the output component combines both the input components. Moreover, a POSITA would have understood that a single-ended amplifier was usually used to generate the output signal off-chip, and would have found it obvious to use a singled-ended amplifier, as needed.

Petitioner's Experts Take Inconsistent Positions

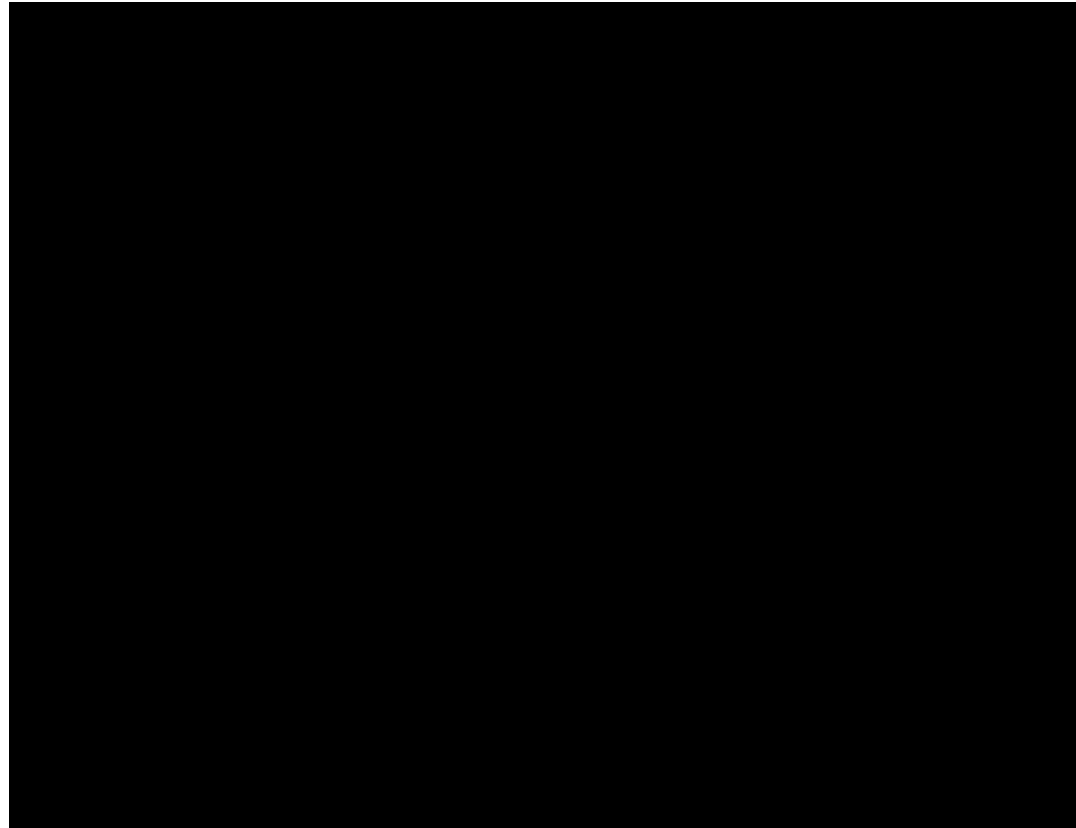
Galton:



169. As I explain supra §VI.C, a fully differential amplifier generates differential output signal having two complementary components, each combining the two complementary components of the differential input signal.

Eddie Device Practices the Challenged Claims

Ricketts:



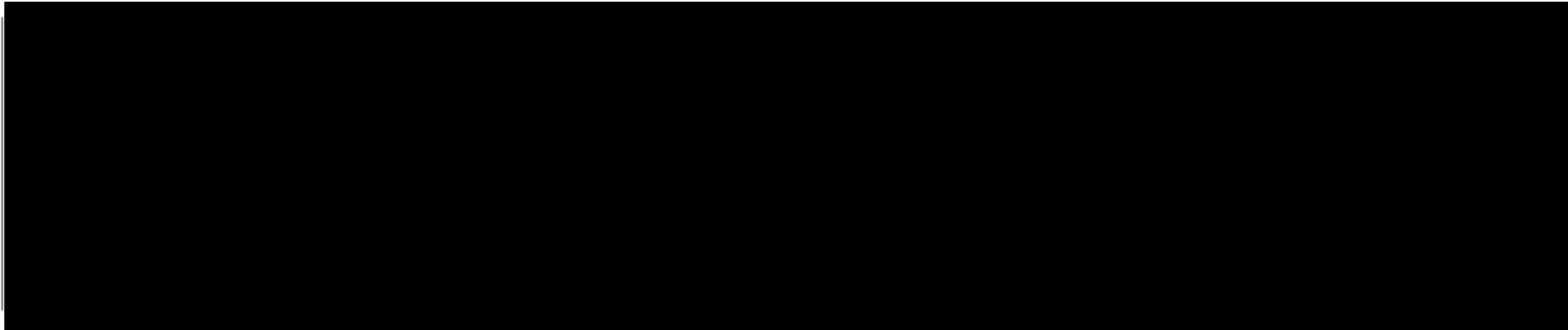
Petitioner's Experts Take Inconsistent Positions

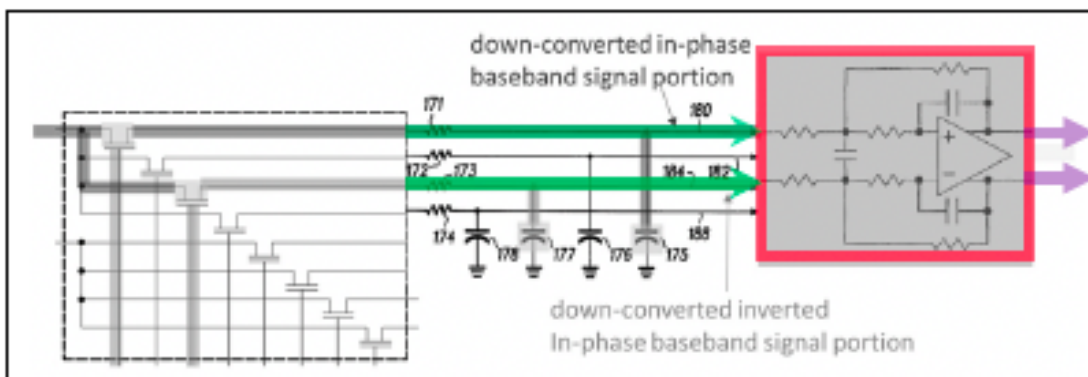
Dickens:

24. I understand “combining” to include merging two or more signals into a single output signal. And in the circuit in EX2011, [REDACTED]

[REDACTED]

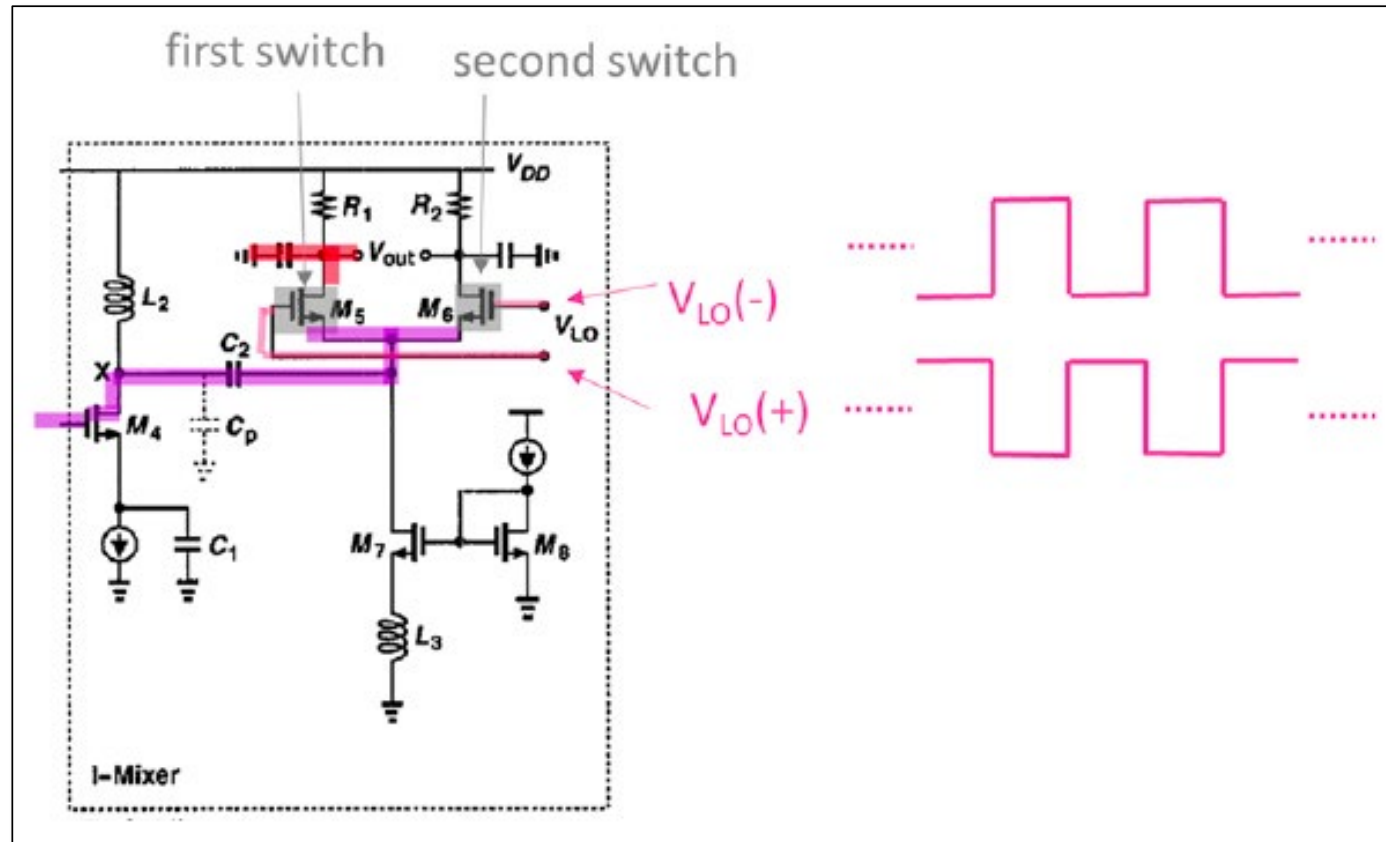
Petitioner's Experts Take Inconsistent Positions





Petitioner's Experts Take Inconsistent Positions

Galton:



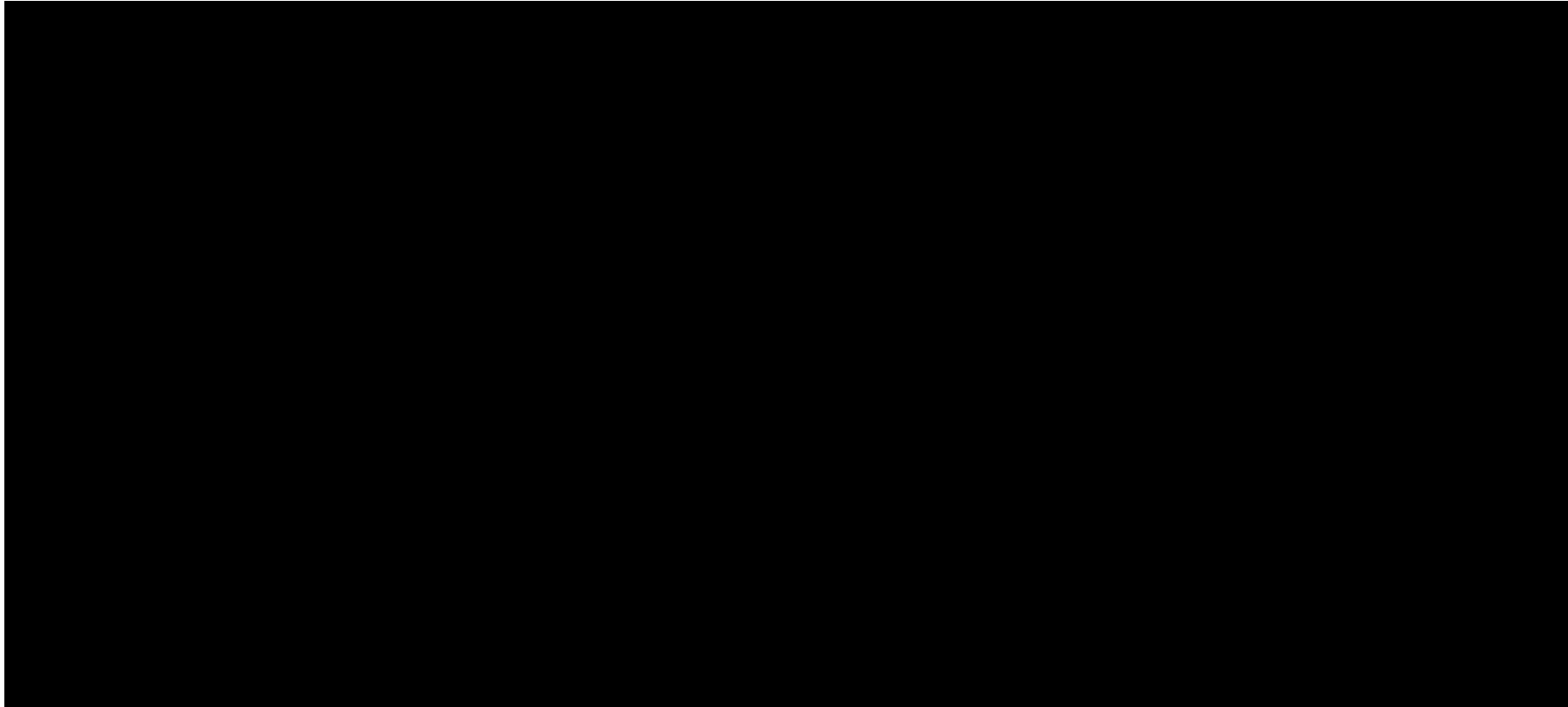
Sur-Reply, 7-8; Ex. 1003, ¶¶118, 231, 236.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

59

Eddie Device Practices the Challenged Claims

Ricketts:

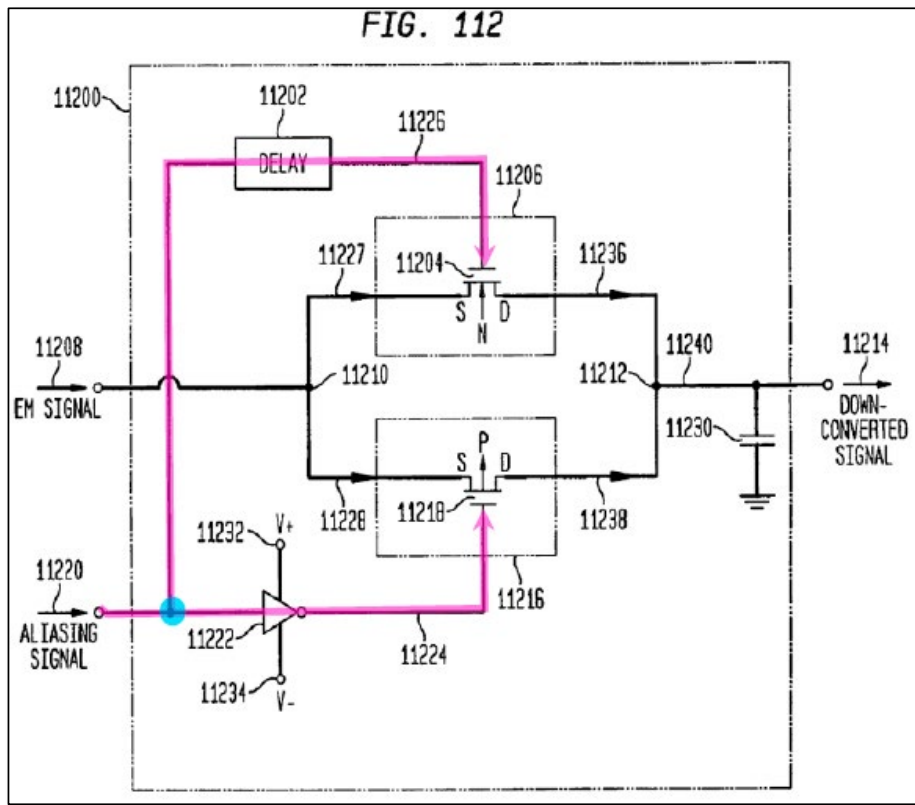


Sur-Reply, 8-9; Ex. 2015,14, 24.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

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'177 Patent is Consistent with Ricketts' Position



This requires that two complementary aliasing signals **11224**, **11226** be generated from aliasing signal **11220** to control the sampling by FETs **11218**, **11204**, respectively.

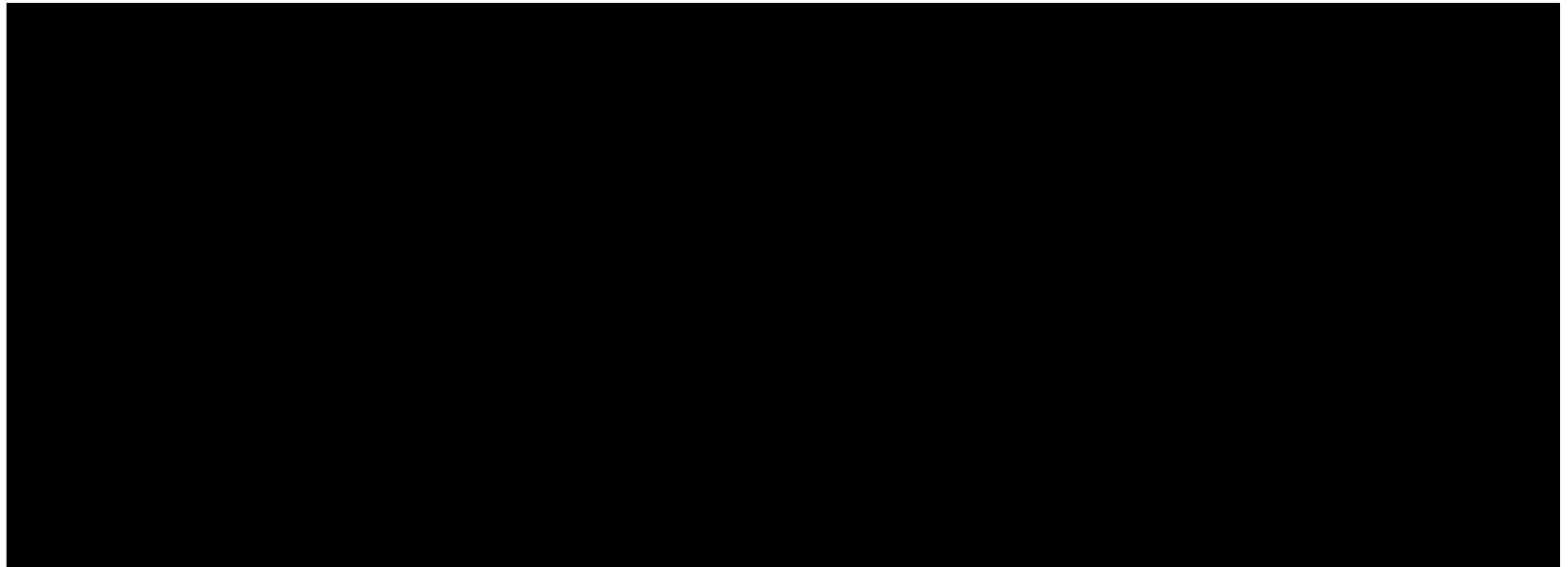
Sur-Reply, 10-11; Ex. 1001,109:60-63, Fig. 112.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

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Petitioner's Experts Take Inconsistent Positions

Dickens:



Sur-Reply, 6-10; Ex. 1067, ¶¶13-15.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

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Eddie Device Stores Non-Negligible Amount of Energy

If a circuit “operates in a manner that successfully down-converts and does so in a commercially viable system,” this is sufficient evidence that a capacitor stores non-negligible amounts of energy.

TCL Indus. Holdings Co. v. ParkerVision, Inc.,
IPR2021-00985, Paper 44 at 58 (P.T.A.B. Nov. 17, 2022).

Dickens Admits That the Eddie Device Down-Converts

Q Okay. And so what [REDACTED] report shows is that when you look at the, about [REDACTED] megahertz input signal, and then you look at Figure 2-3, which shows an approximately [REDACTED] output signal, that the Eddie device being tested performs down conversion, correct?

A Yes.

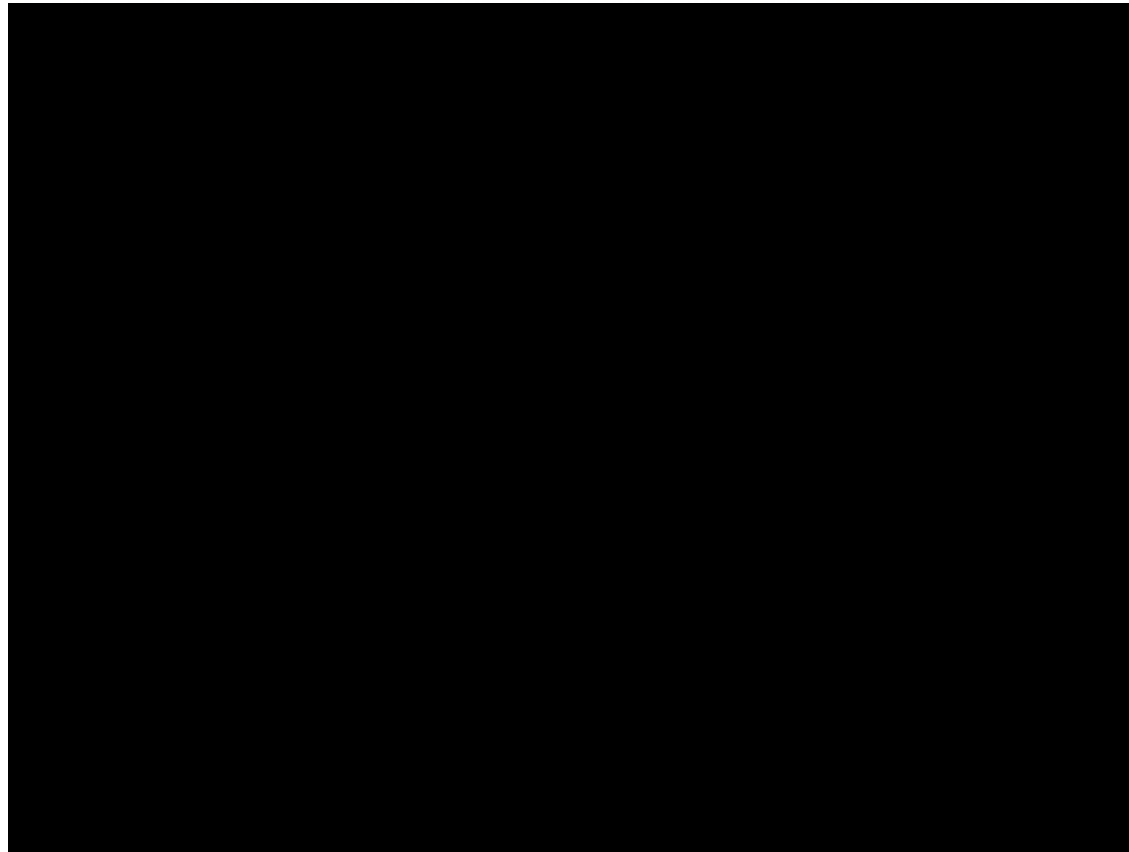
Dickens Admits That the Eddie Device Is Commercially Viable

Q All right. If we go back to [REDACTED] report and we look at this [REDACTED] signal to noise ratio output for a [REDACTED] signal input, that indicates that this is, you know, something that could be used, or that's like the level that could be used for a -- a consumer wireless device in 1998 to 2000 time frame, correct?

ATTORNEY MAGEE: Objection to form.

A Yes. In general, I would agree with that statement. That's correct.

Dickens Ignores Eddie's Actual Testing Configuration



Sur-Reply, 13; Ex.-1067, ¶¶16-20.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

66

Dickens Ignores Eddie's Actual Testing Configuration

In preparing your opinions in this case, or in the IPRs, did you do anything to confirm that the Eddie device that [REDACTED] tested used any of the [REDACTED] shown in Exhibit 2011, which is the schematic.

ATTORNEY MAGEE: Objection to form.

A No. I didn't do any of that. I mean, I was told that that was the schematic, so I was asked to analyze that. I didn't -- I didn't try to analyze -- I didn't hypothesize what -- what circuit they might have been using.
No. I didn't do that.

And in fact, [REDACTED] If you go back to the -- to the schematic, they show that the -- [REDACTED]
[REDACTED]

Dickens Ignores Eddie's Actual Testing Configuration

Exhibit 3 shows that for a [REDACTED] megahertz signal, the device under test would have a [REDACTED] input impedance real part, correct?

ATTORNEY MAGEE: Objection. Form.

A Yes. That's correct. The real part would be -- [REDACTED] That's correct. And the imaginary is [REDACTED]

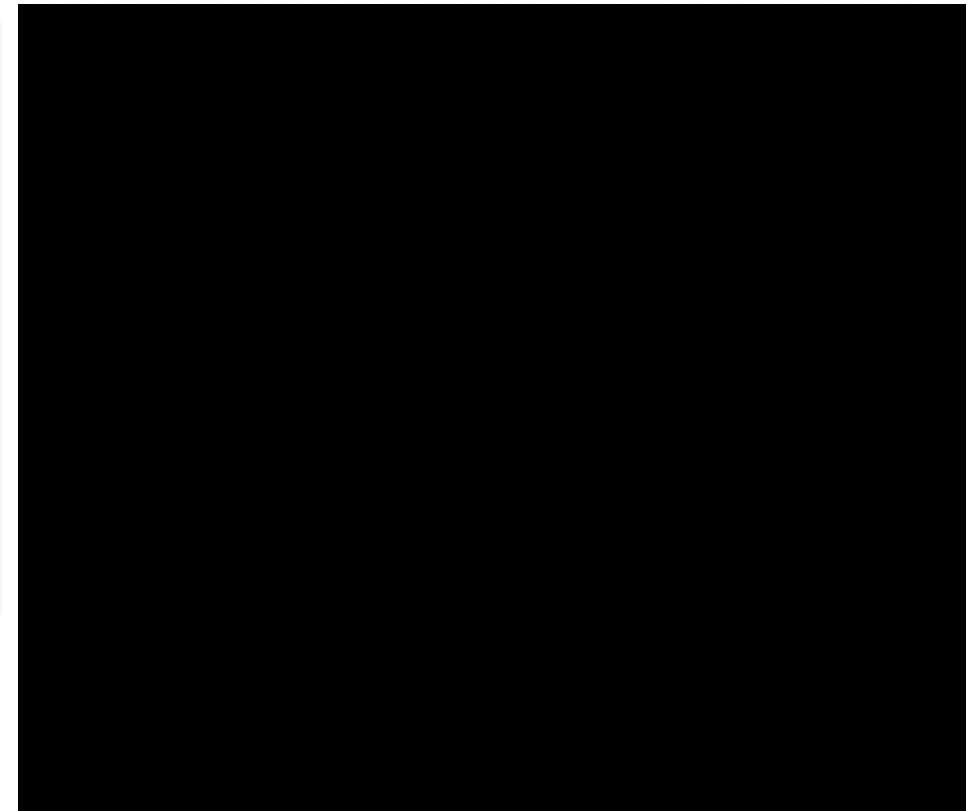


Figure 7-3 RF input impedance

Sur-Reply, 12-14; Ex.-1067, ¶¶16-20;
Ex.-2043, 30:16-22.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

68

Dickens Has No Basis for the Impedance of SP1 and SP2

Sur-Reply, 14; Ex.-1067, ¶¶16-17.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

69

Dickens' Admits the Boeing Report Demonstrates Down-Conversion

Dickens' Admission:

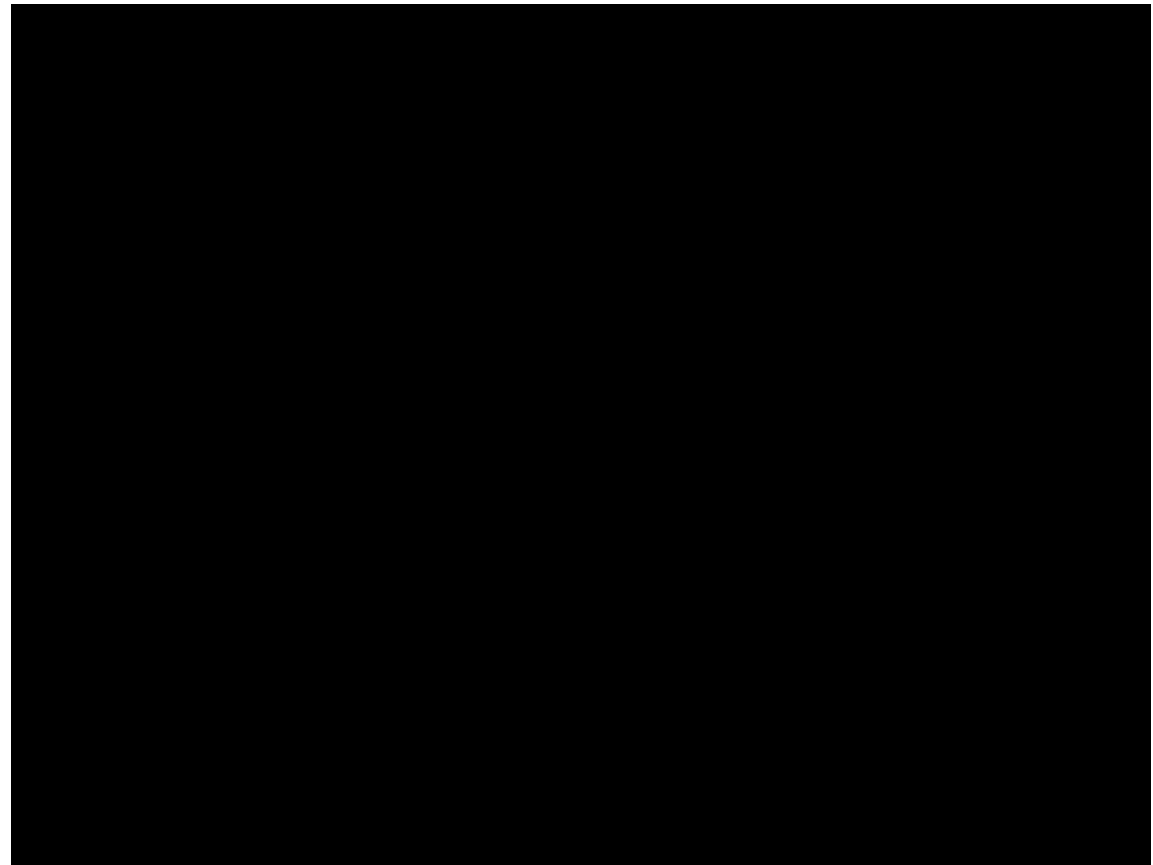


Sur-Reply, 14; Ex.-2010,7-8;
Ex.-2043,54:2-8.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

70

Dickens Fails to Address the Relevant Capacitors



Reply,14-17; Sur-Reply, 17; Ex. 2015, 20.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

71

Claim Construction

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

72

Claim Construction – “Energy Storage Element”

Claims 1 and 19:

- “a portion of **energy** *that is distinguishable from noise is **transferred*** from the modulated carrier signal,”
- “energy storage element that *stores the **transferred** energy...*,”
- “the portions of **transferred energy** ... *are integrated over time to accumulate said portions of **transferred energy*** from which [the down-converted signals portions] are derived.”

Claim Construction – “Energy Storage Element”

“storage element” means “an element of a system that stores non-negligible amounts of energy from an input EM signal.”

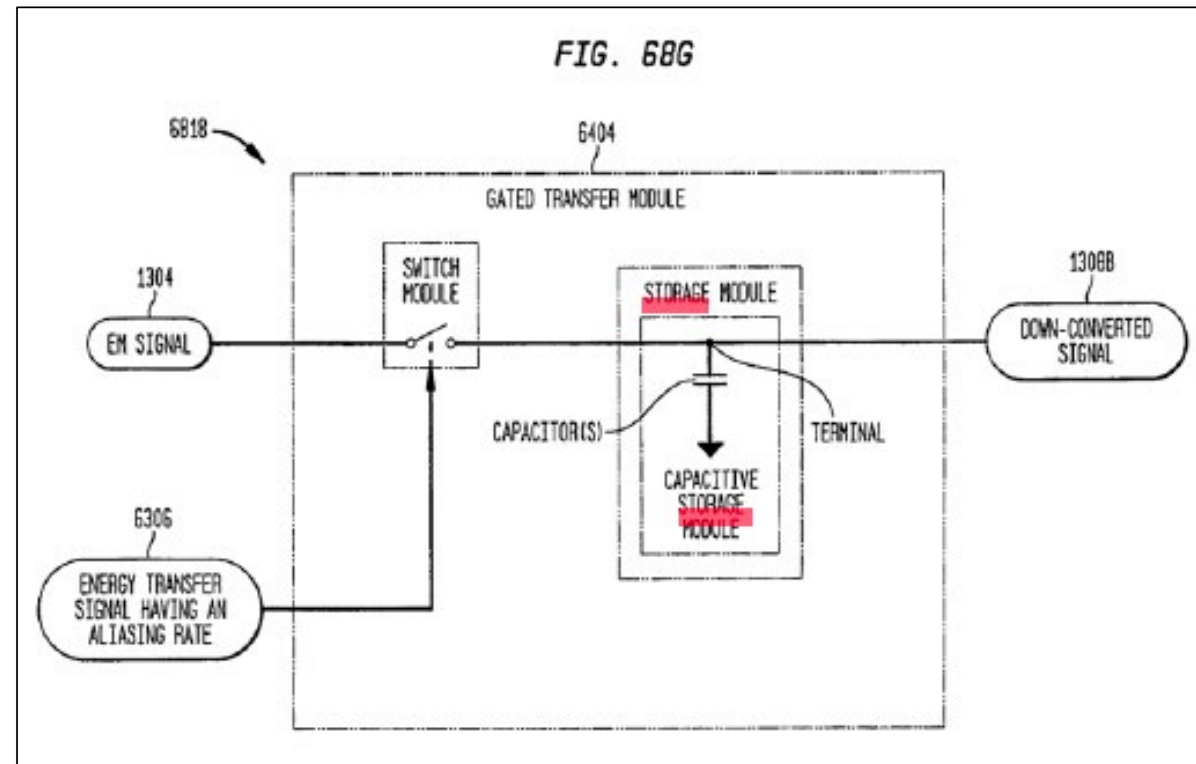
Intel Corp. v. ParkerVision, Inc., IPR2020-01265, Paper 44, at 44 (PTAB Jan. 21, 2022)

Claim Construction – “Energy Storage Element”

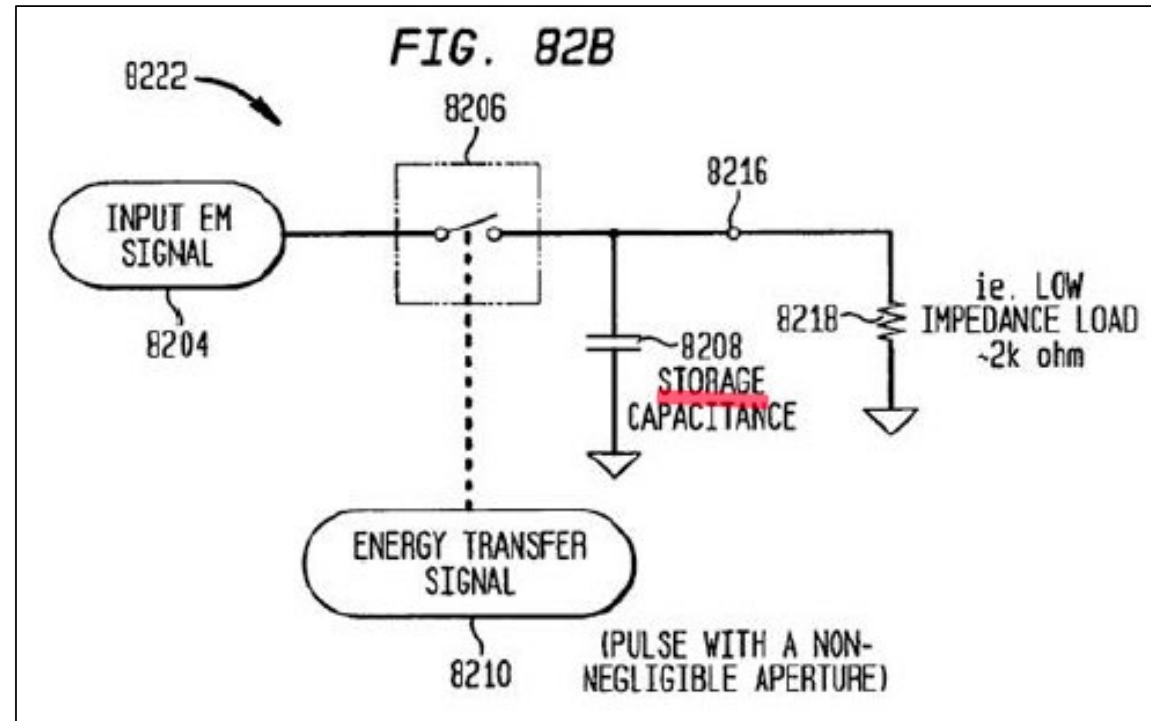
“ParkerVision’s down-converting system uses a technique called ‘energy sampling,’ which differs from the technique of ‘voltage sampling,’ which was used in conventional down-converting systems.”

ParkerVision v. Qualcomm, 116 F.4th 1345, 1349 (Fed. Cir. 2024)

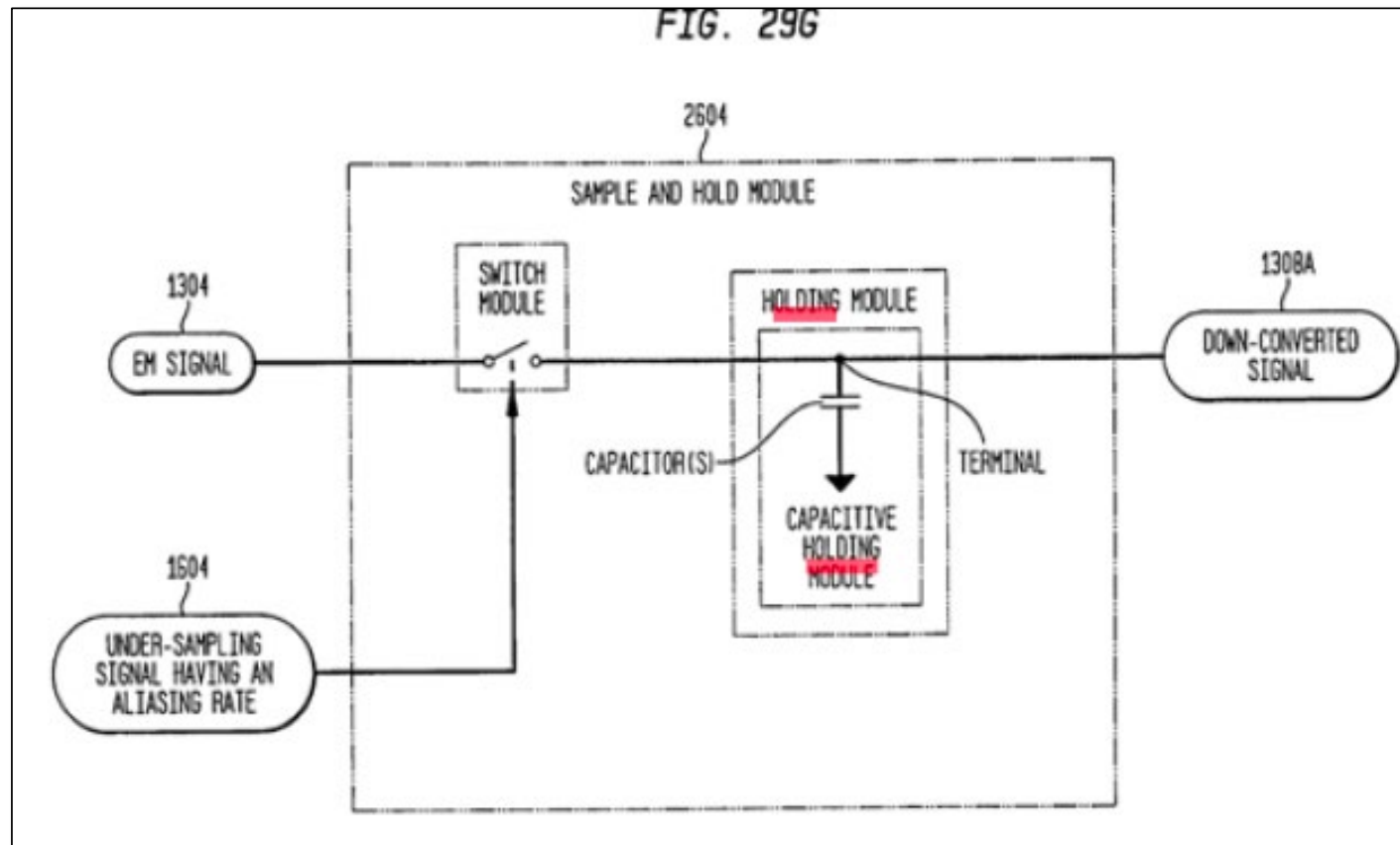
Claim Construction – “Energy Storage Element”



Claim Construction – “Energy Storage Element”



Claim Construction – “Energy Storage Element”

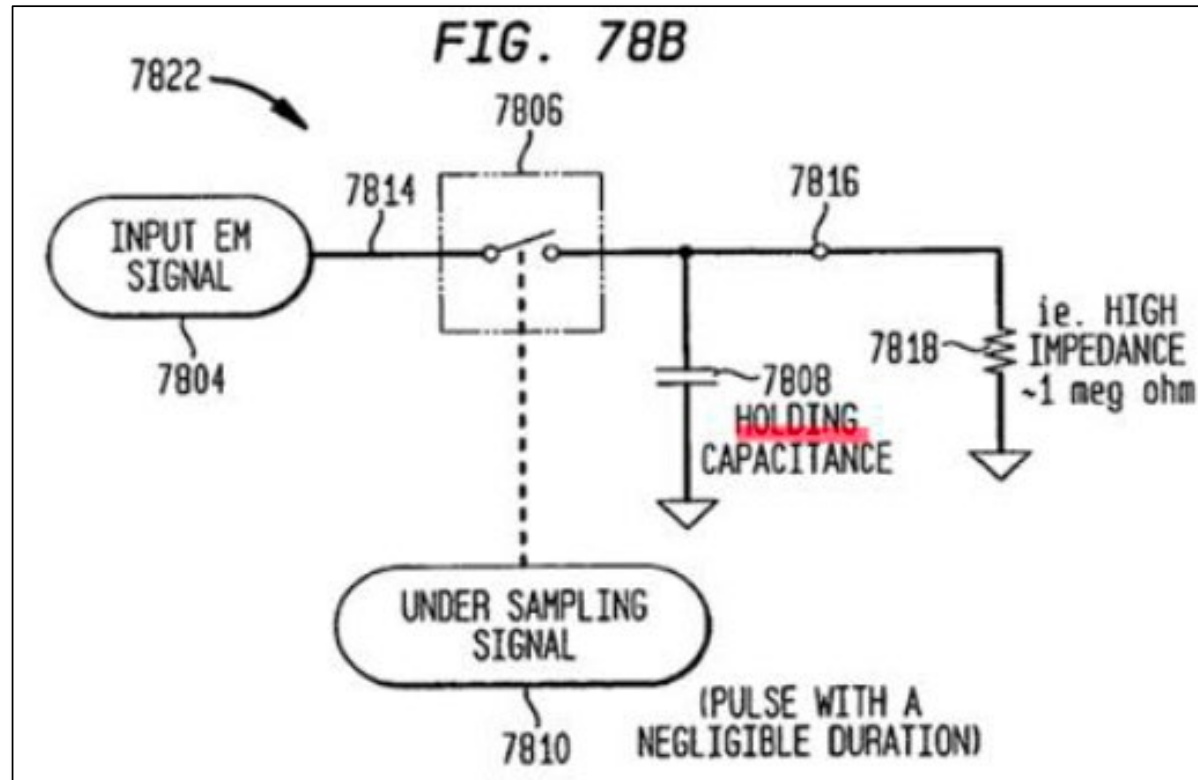


POR, 52-56.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

78

Claim Construction – “Energy Storage Element”



Tayloe And Macnally Are Not Prior Art

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

80

Tayloe is Not Prior Art

Filed:

Oct. 15, 1998

United States Patent
Tayloe

(10) Patent No.: **US 6,230,000 B1**
(45) Date of Patent: **May 8, 2001**

(54) **PRODUCT DETECTOR AND METHOD THEREFOR**

(75) Inventor: **Daniel Richard Tayloe**, Phoenix, AZ (US)

(73) Assignee: **Motorola Inc.**, Schaumburg, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/173,030**
(22) Filed: **Oct. 15, 1998**

(51) Int. Cl.⁷ **H04B 1/26; H04B 1/00**
(52) U.S. Cl. **455/323; 455/303; 455/304; 455/313**

(58) Field of Search 455/302, 303, 455/304, 324, 338, 339, 313, 318, 323, 375/323, 329, 332, 327/113, 45; 329/304

(56) **References Cited**

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FOREIGN PATENT DOCUMENTS

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OTHER PUBLICATIONS

Article entitled "A 1.5 GHz Highly Linear CMOS Down-conversion Mixer" published in IEEE Journal of Solid-State Circuits, vol. 30, No. 7, Jul. 1995.
Article entitled "Recent Advances in Shortwave Receiver Design" by Dr. Ulrich L. Rohde in QST, Nov. 1992.
Article "Asymmetric Polyphase Networks" by M.J. Gingell in Electrical Communication, vol. 48, No. 1 and 2, 1973.
Article entitled "High-Performance, Single-Signal Direct-Conversion Receivers" by Rick Campbell—QST Magazine (Jan. 1993).

* cited by examiner

Primary Examiner—Dwayne Bost
Assistant Examiner—Raymond B. Persino
(74) **Attorney, Agent, or Firm**—Dana B. LeMoine; Timothy J. Lorenz; Frank J. Bogacz

(57) **ABSTRACT**

A product detector for converting a signal to baseband includes a commutating switch which serves to sample an RF waveform four times per period at the RF frequency. The samples are integrated over time to produce an average voltage at 0 degrees, 90 degrees, 180 degrees and 270 degrees. The average voltage at 0 degrees is the baseband in-phase signal, and the average voltage at 90 degrees is the baseband quadrature signal. Alternatively, to increase gain, the 0 degree average can be differentially summed with the 180 degree average to form the baseband in-phase signal, and the 90 degree average can be differentially summed with the 270 degree average to produce the baseband quadrature signal.

14 Claims, 3 Drawing Sheets

BIAS NETWORK

RF FILTER

BASEBAND INPHASE

BASEBAND QUADRATURE

90° PHASE DELAY

PHASE DELAY

0°

90°

180°

270°

40

42

44

46

48

50

52

54

56

58

60

62

f1

f0

C1

C2

C3

C4

C5

C6

C7

C8

C9

C10

C11

C12

C13

C14

C15

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10 September 1998 (10.09.98)

(57) Abstract

Tayloe And TI Datasheet Fails To Disclose/Teach/Suggest Numerous Claimed Elements

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

83

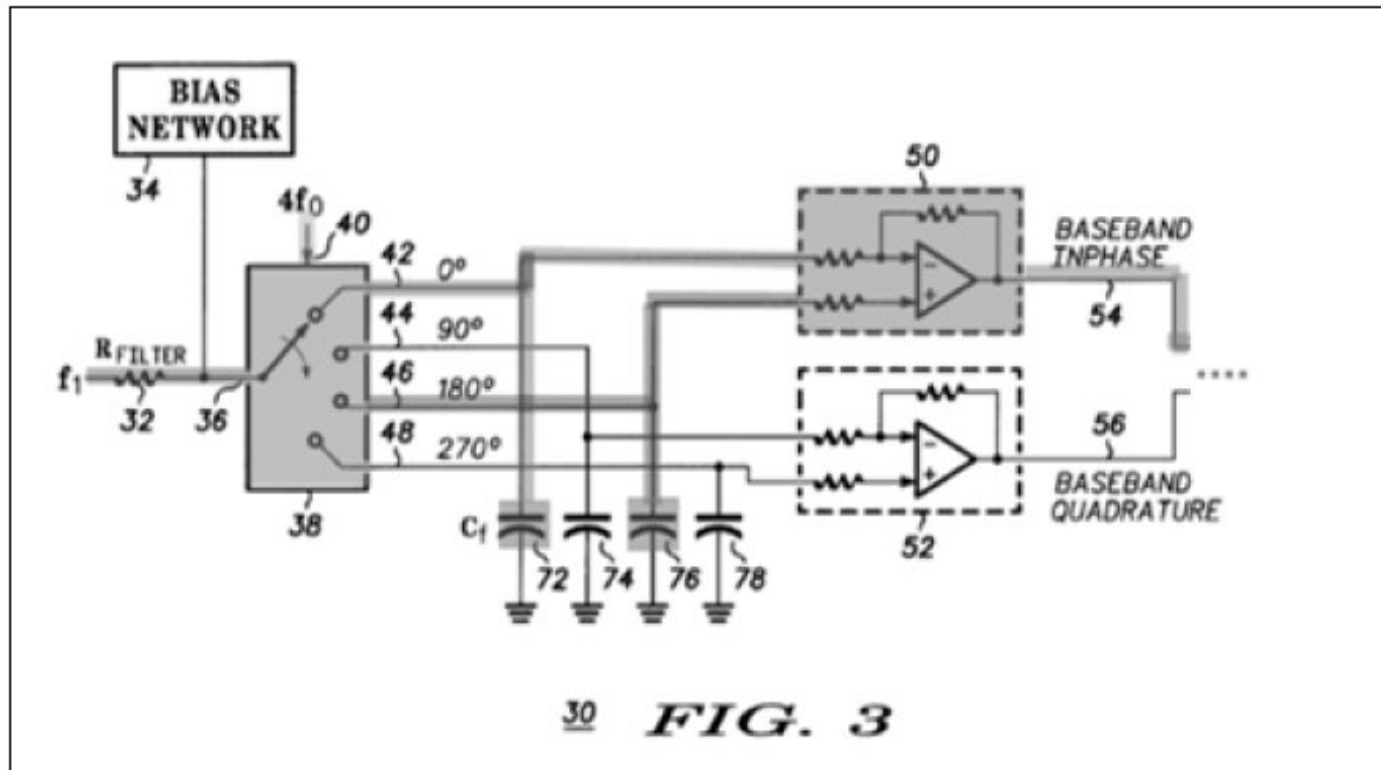
Petitioner cannot map numerous claim elements to Tayloe/TI Datasheet. In particular, Tayloe/TI Datasheet does not disclose/teach/suggest (1) a “energy storage element” that stores transferred energy and outputs a baseband signal portion, (2) deriving a baseband signal portion from accumulated transferred energy, or (3) outputting a differential baseband signal (claims 1, 19). Tayloe/TI Datasheet also does not disclose/teach/suggest transferred energy being discharged when a switch is OFF (claims 8, 9, 26, 27). Ex.-2024, ¶¶279-284; *compare* Ex.-1004, Fig. 3 with Ex.-2037, pp. 523 (Fig. 10.1-3(a) sample-and-hold circuit) (Tayloe and Fig. 10.1-3(a) both show a switch and the output of a capacitor directly connected into an amplifier).

Lack of Motivation to Combine Tayloe and Macnally

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

85

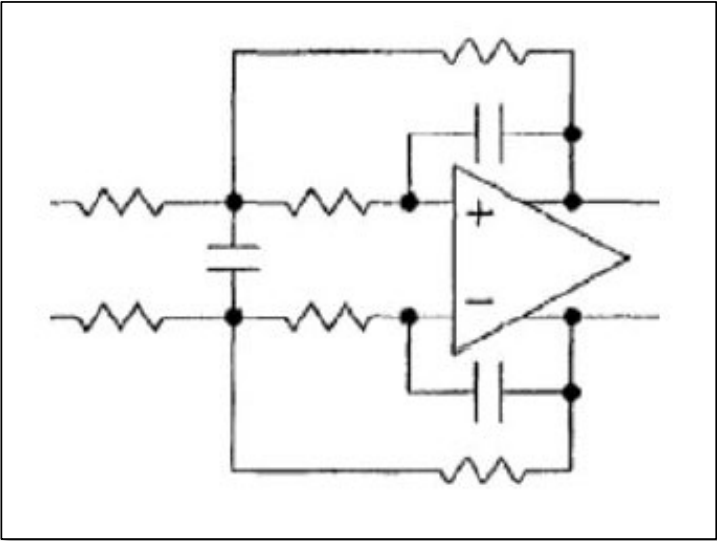
Tayloe



Macnally

FIG. 3

The diagram shows a PLL circuit. At the bottom, a differential pair of NMOS transistors (M1, M2) is biased by a tail current source (M3, M4) connected to V_{CAS} . The gates of M1 and M2 are connected to a common-mode feedback network consisting of resistors R1 and R2, and a PMOS transistor M5. The gates of M3 and M4 are connected to a common-mode feedback network consisting of resistors R3 and R4, and a PMOS transistor M6. The outputs of the differential pair are connected to the inputs of a phase-locked loop (PLL) block, which is represented by a blue box. The PLL block contains two op-amp comparators and a feedback network. The PLL block is labeled "Antialias Filter".

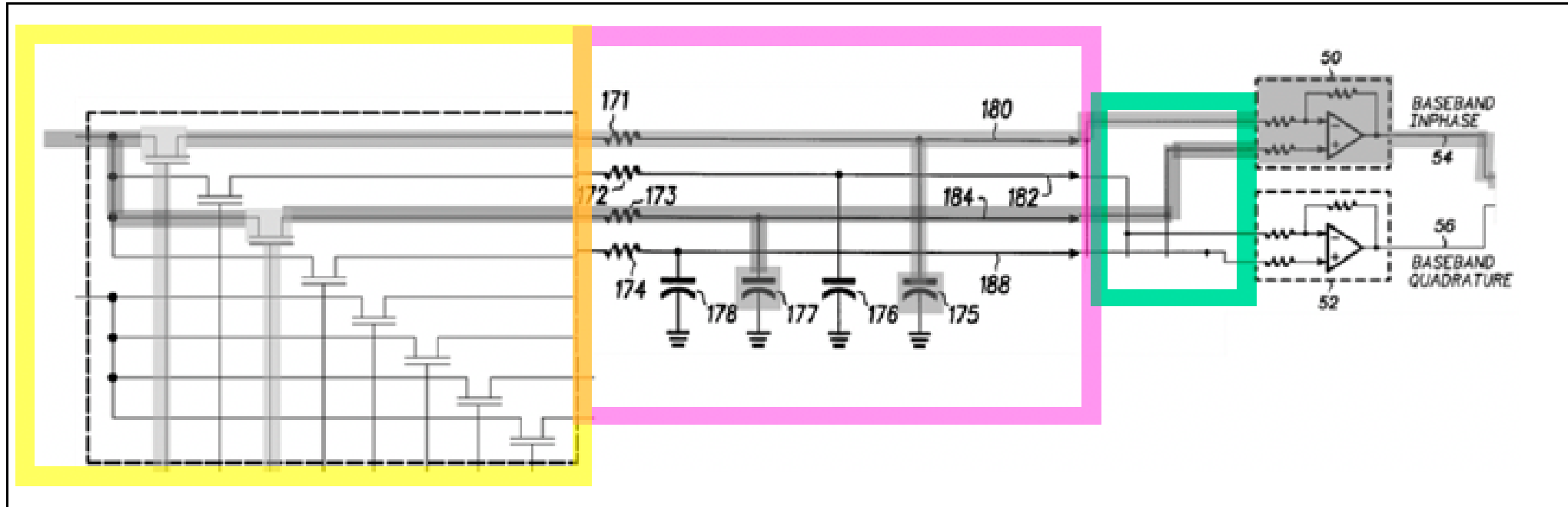


POR, 75-76.

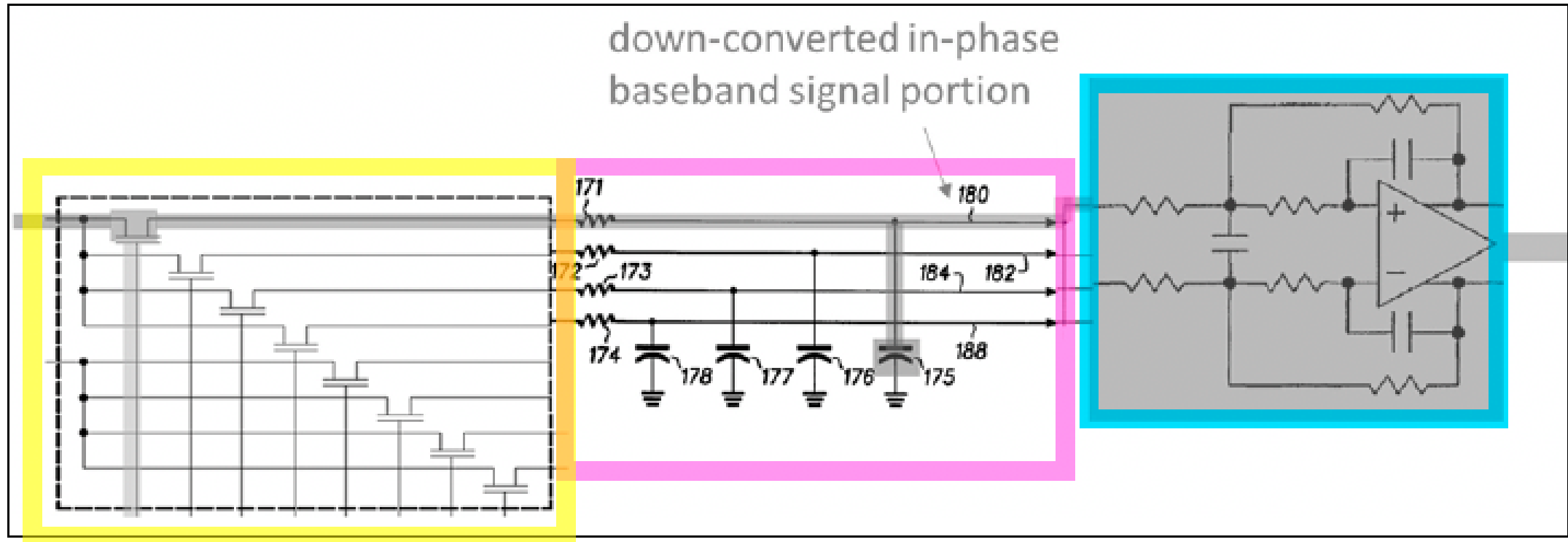
DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

87

No Motivation to Combine Tayloe and Macnally



No Motivation to Combine Tayloe and Macnally



No Motivation to Combine Tayloe and Macnally

Petition:

A POSITA would have been motivated to adapt Tayloe's system as a single-chip (i.e., integrated circuit known as IC) to meet relentless market demand for improved product size/performance, and decreased unit cost.

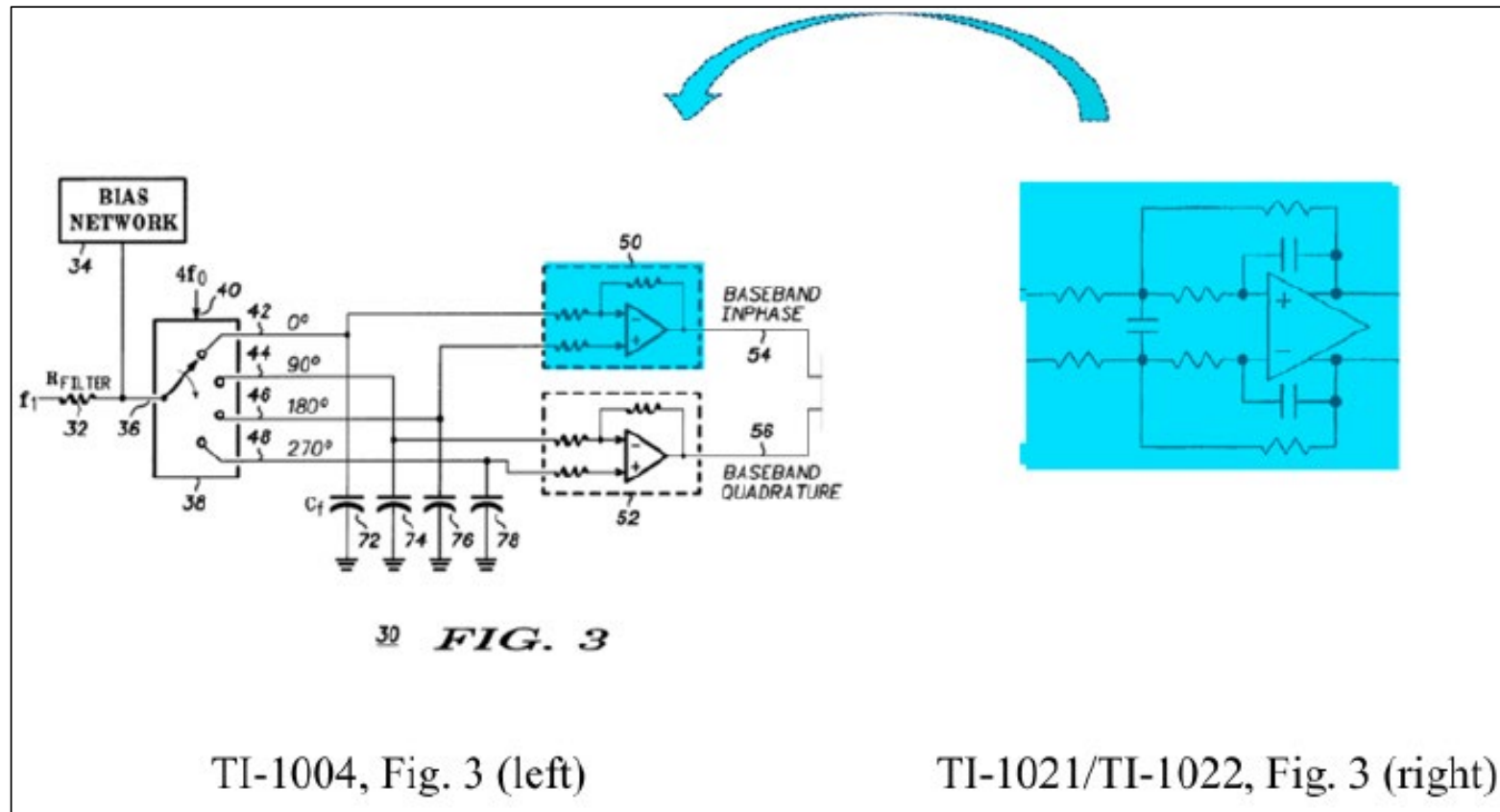
No Motivation to Combine Tayloe and Macnally

Galton:

Q. What is meant by "single-chip"?

A. Well, okay. So first of all, this isn't my document, but I -- I assume that what it -- what it -- what it means is to put, you know, the essential functionality of Tayloe's system on a single IC.

No Motivation to Combine Tayloe and Macnally



POR, 83-84; Sur-Reply, 25; Ex. 2024, ¶306;
Ex. 2042, 41:19-22, 58:9-16.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

92

No Motivation to Combine Tayloe and Macnally

Tayloe:

The prototyped direct conversion receiver has an input bandwidth of roughly 1 kHz centered at 7 MHz. This was accomplished with resistor 32 at 50 ohms, and each of capacitors 72–78 at 0.3 microfarads.

No Motivation to Combine Tayloe and Macnally

Ricketts:

306. To the contrary, a POSITA would understand that Tayloe specifically teaches away from implementing its product detector in an integrated circuit. For example, Dr. Galton proposed mock-up circuit includes Tayloe's capacitors. But a POSITA would recognize that Tayloe's capacitors would not be suitable for integration due to their extremely large size. Specifically, a POSITA understands that capacitances larger than 1 pico-Farad are difficult/generally impractical due to integrated on-chip space and process limitations. Yet, the embodiment disclosed in Tayloe's Experimental Results section uses a 0.3 microfarads capacitor – 300,000 times larger than what is considered feasible (1 pico-Farad) in an IC. *See*. Ex.-1004, 5:50-51. Thus, a POSITA would recognize Tayloe's capacitors would be off chip, not integrated.

POR, 83-84; Sur-Reply, 25; Ex. 2024, ¶306;
Ex.-2042, 41:19-22, 58:9-16.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

94

No Motivation to Combine Tayloe and Macnally

Galton:

Q. Okay. A .3 microfarad capacitor is too large for feasible integration into an integrated circuit, correct?

A. Yes.

Combining Tayloe with Macnally does not eliminate or reduce Tayloe's capacitor requirements, correct?

A. That is correct.

Q. So if you combine Tayloe and Macnally, the capacitors still have to be, certainly, off-chip, correct?

A. To a large extent, yes.

No Motivation to Combine Tayloe and Macnally

Moreover, Tayloe specifically states that a “*prototyped* direct conversion receiver” was built using the circuit of Figure 3. Ex.-1004, 5:49-50. Tayloe admits that the prototype could not handle higher frequency signals which were “many orders of magnitude greater than the prototyped unit.” *Id.*, 5:34-59. While Tayloe states that higher-frequency receivers were possible to build, Tayloe provides no example/guidance on how to achieve this. Notably, as discussed below, the TI Datasheet multiplexer cannot support higher frequencies because it cannot switch fast enough. Ex.-2024, ¶307.

Macnally's Filter Fundamentally Changes Tayloe's Circuit

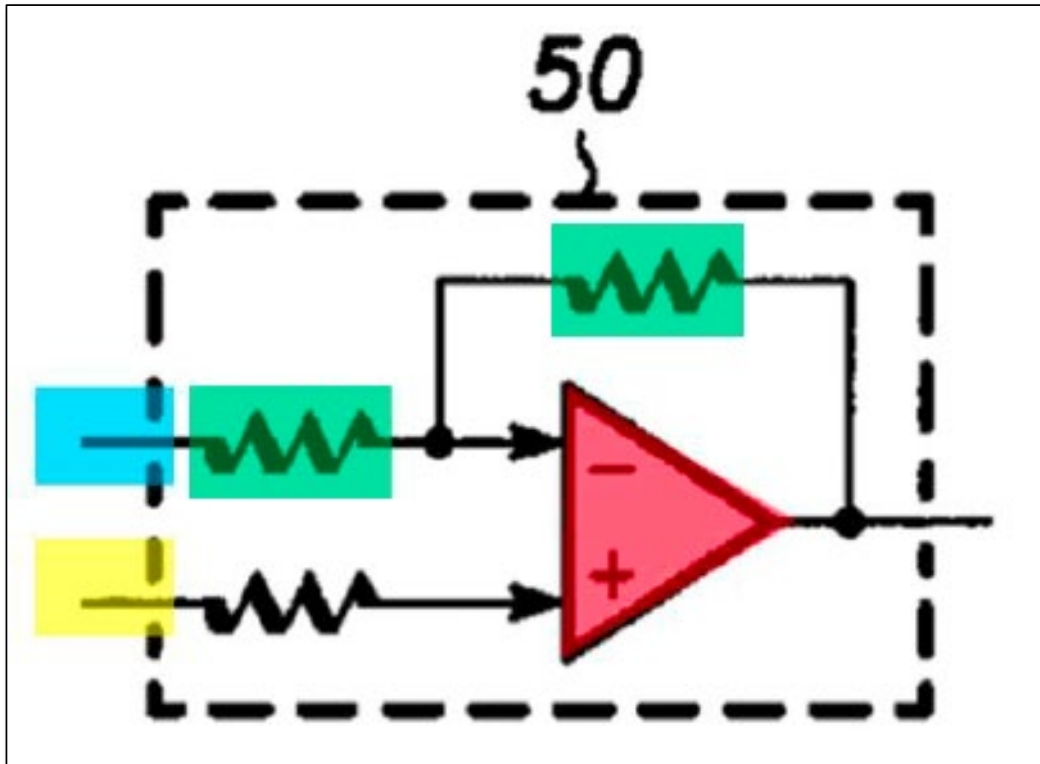
Reply:

PO's assertion of incompatibility (POR, 93-94) is unsupported. In fact, the top inputs of Tayloe's summing amplifier boxes 50/52 have low impedances. TI-1066, ¶¶95-97, *supra* §IV.A.1(a)(i). Therefore, replacing Tayloe's boxes 50/52 with fully-differential amplifier circuits having comparable input impedances would not significantly alter the behavior of Tayloe's circuit with respect to the 0° and 90° outputs of switch 38. TI-1066, ¶¶95-97.

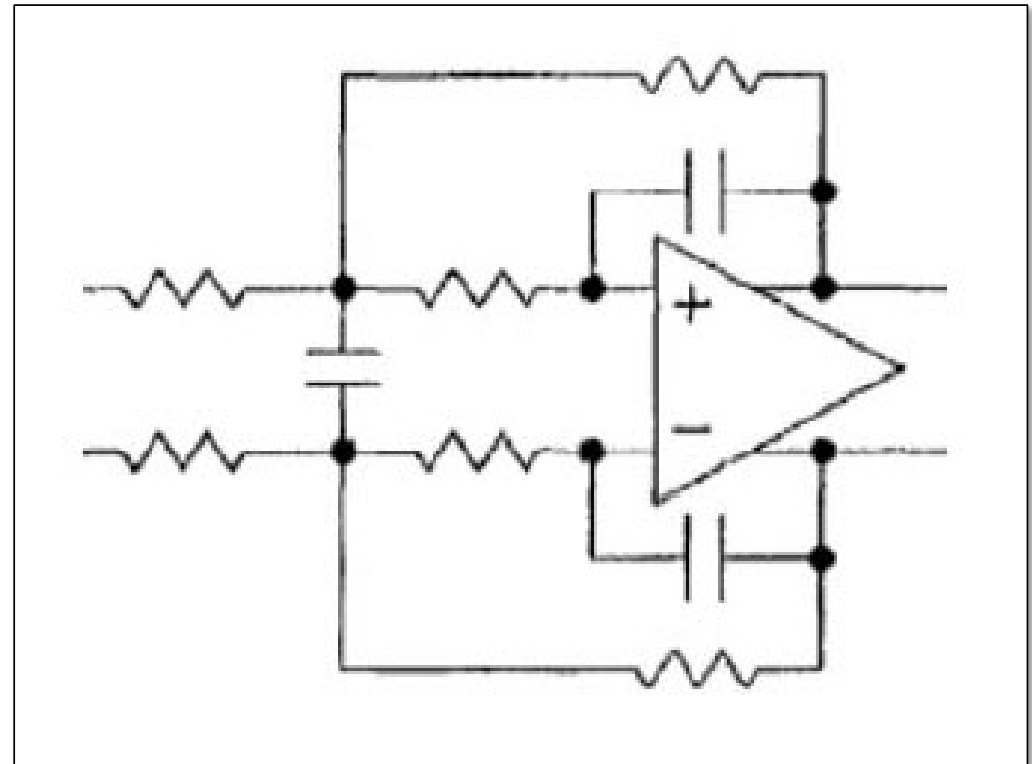
PO's assertion must also fail for characterizing Tayloe as a voltage sampling system. POR, 92-94. PO does not, and could not, reconcile the fact that two of Tayloe's four capacitors are already coupled to low impedance loads.

Input Impedances of Tayloe's Amplifiers and Macnally's Filters are not Comparable

Tayloe: High Impedance



Macnally: Low Impedance



POR, 79; Sur-Reply, 29-30.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

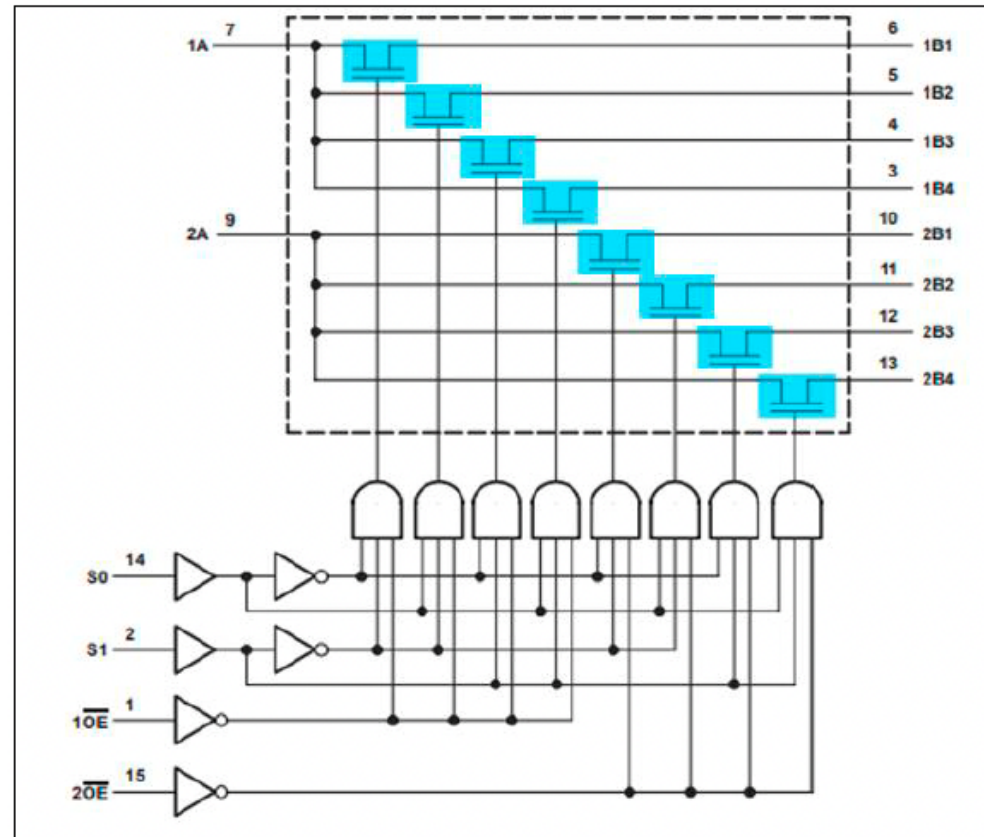
98

Petitioner Makes Misrepresentations And Fails To Address Issues

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

99

Tayloe Never Suggests Combining Figure 6 with TI Datasheet

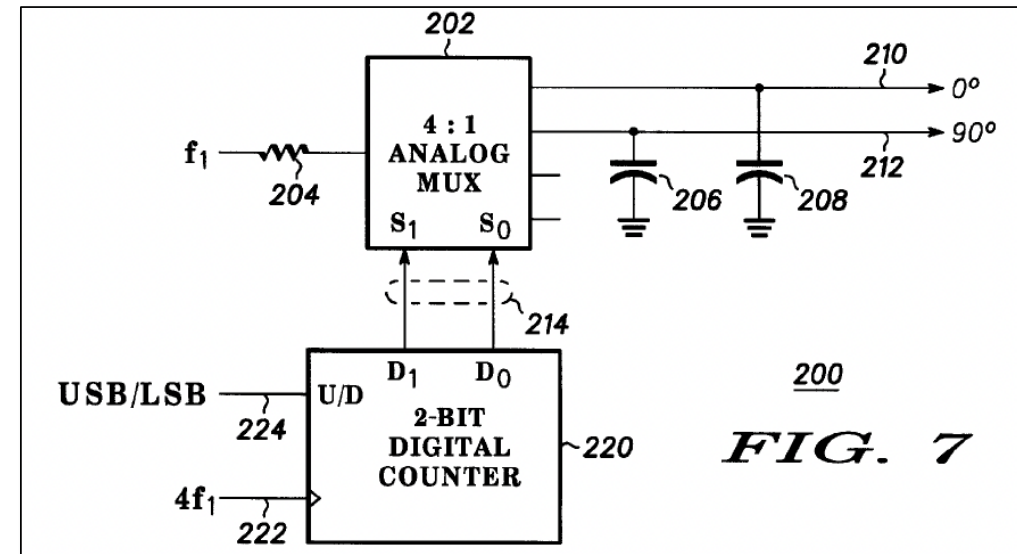
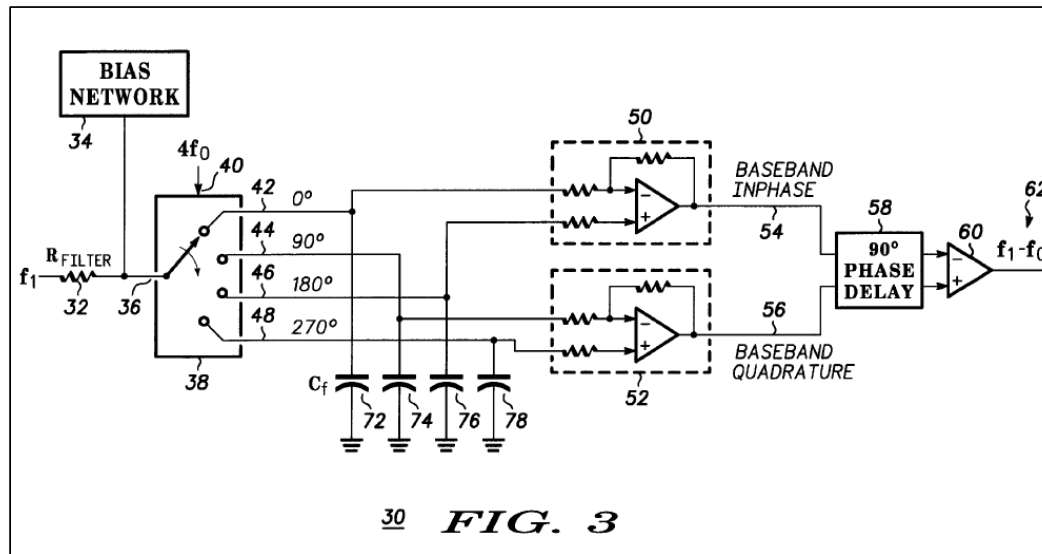


POR, 80-81; Reply, 25; Sur-Reply, 30.

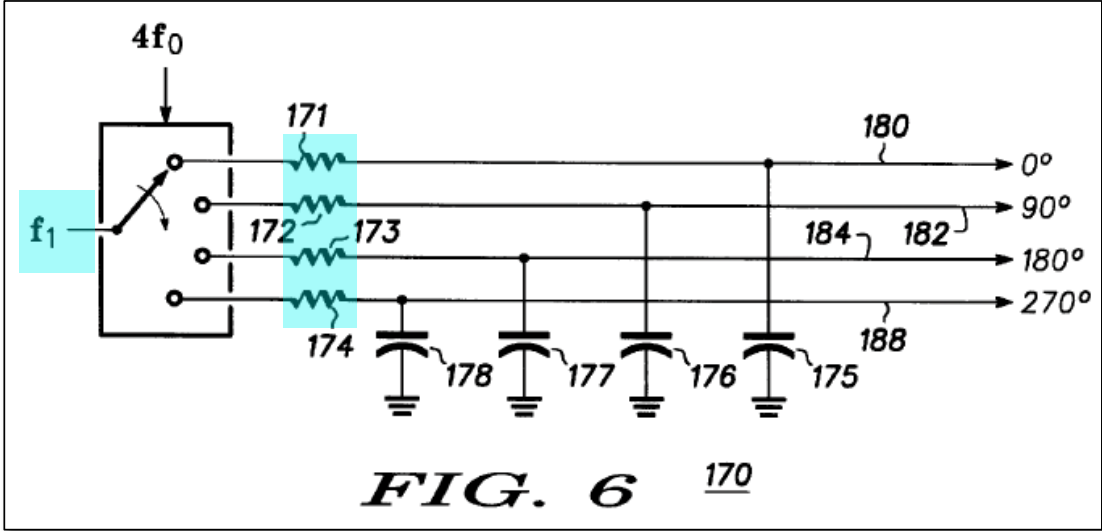
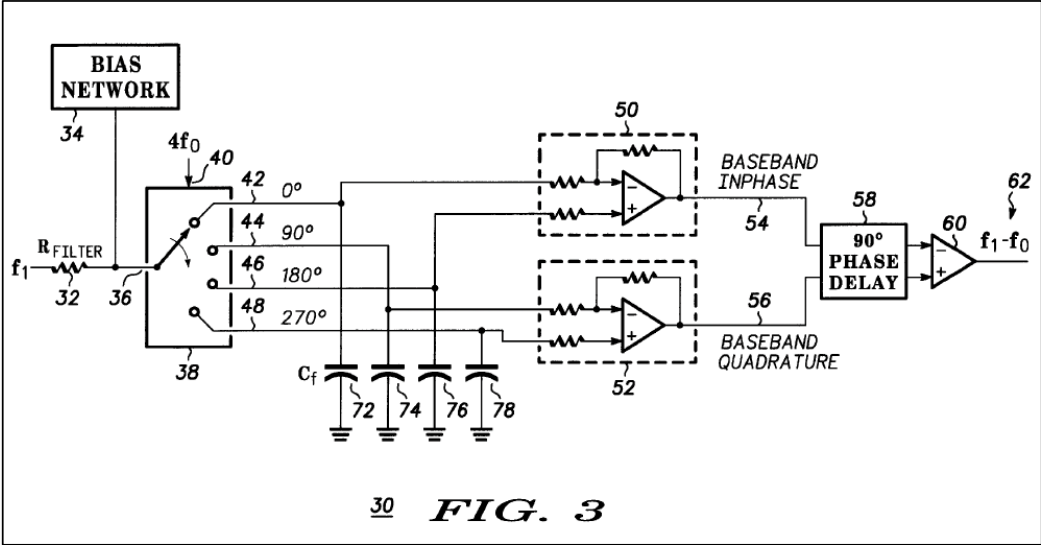
DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

100

Tayloe Discloses Using TI Datasheet For Figures 3 or 7



Taylor Figures 3 and 6 Are Different Embodiments



Tayloe Does Not Teach That “+” Inputs Are Optional

As embodied in FIG. 7, 0 degree output **210** and 90 degree output **212** are used to generate baseband in-phase and quadrature signals. Of course, the remaining two outputs (180 degrees and 270 degrees) can be utilized as embodied in FIG. 3 to achieve greater gain.

Third, regarding Galton's *sole* basis for motivation to combine Tayloe/TI/Macnally (i.e., achieve a single-chip IC), Ricketts explains that single-chips can be realized by operating at higher frequencies (e.g., 915MHz, as in Macnally), which allows for smaller-sized components compatible with IC design. POR,85-86 (citing Ex.-2024, ¶¶311-15). But, as Ricketts explains, the switches disclosed in the TI Datasheet (the same switches Galton relies on for invalidity) cannot operate at the speeds needed to handle high frequencies (e.g., 915MHz). *Id.* The Reply does not address this.

Fourth, in response to Galton's argument that fully differential amplifiers (like Macnally's) provide gain, Ricketts explains that Tayloe's own amplifiers already provide gain and fulfill that function. POR, 87-88 (citing Ex.-2024, ¶¶ 320-23). Thus, a POSITA would have no motivation to replace one amplifier for another simply to obtain gain. *Id.* Again, the Reply ignores this.

Fifth, Galton sets up a strawman by claiming Tayloe has specific problems that motivate a combination with Macnally. But as PO/Ricketts explain, Tayloe's architecture already address those very issues. POR,88-91. Yet again, the Reply ignores this.

Sixth, Ricketts explains that Tayloe's circuit provides performance benefits that *already* address the issues Petitioner/Galton allege drive the motivation to combine. POR,91-92 (citing Ex.-2024,¶¶336-37). The Reply ignores this.

Seventh, Ricketts explains that Macnally's filters would draw current from Tayloe's capacitors, resulting in inaccurate voltage readings needed to recreate the baseband signal. POR,93-94 (citing Ex.-2024,¶¶340-42). The Reply does not address this or deny it.



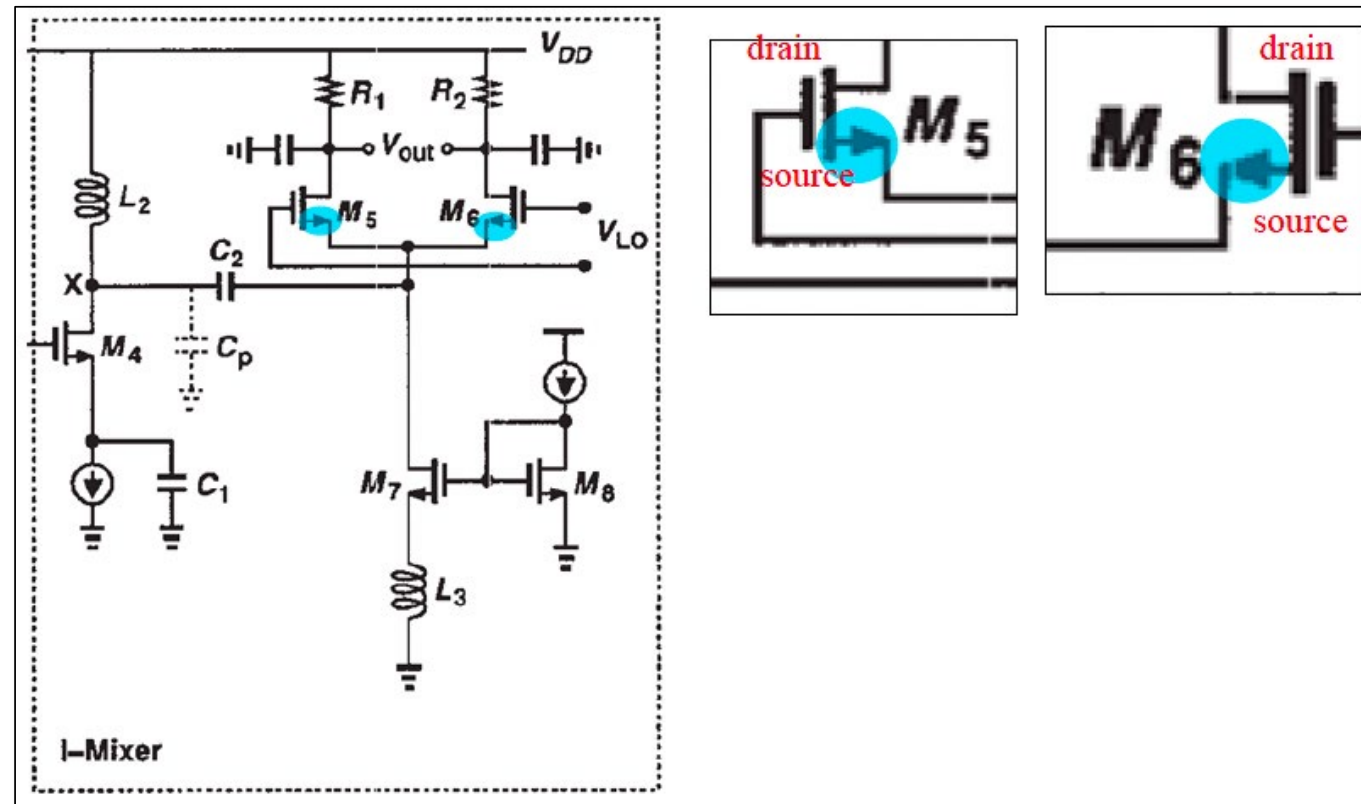
Finally, regarding expectation of success, the Reply has no response whatsoever to Ricketts's argument that (1) incorporating Macnally's filter would require redesigning the signal chain after the filter, which would not lead to predictable results/expectation of success, requires considerable experimentation, and provides no guarantee of improved performance benefits as compared to using Tayloe's amplifiers (*Id.*,95-96 (citing Ex.-2024,¶¶347-49)); (2) using the alleged low impedance Macnally filters instead of Tayloe's amplifiers would have a completely different effects on the circuit (*Id.*,96-97(citing Ex.-2024,¶¶350-53)); and (3) Tayloe already incorporates a filter and Petitioner provides no explanation of how adding Macnally's filter would affect the circuit response (*Id.*,97 (citing Ex.-2024,¶354)).

Lack of Motivation to Combine Razavi and Macnally

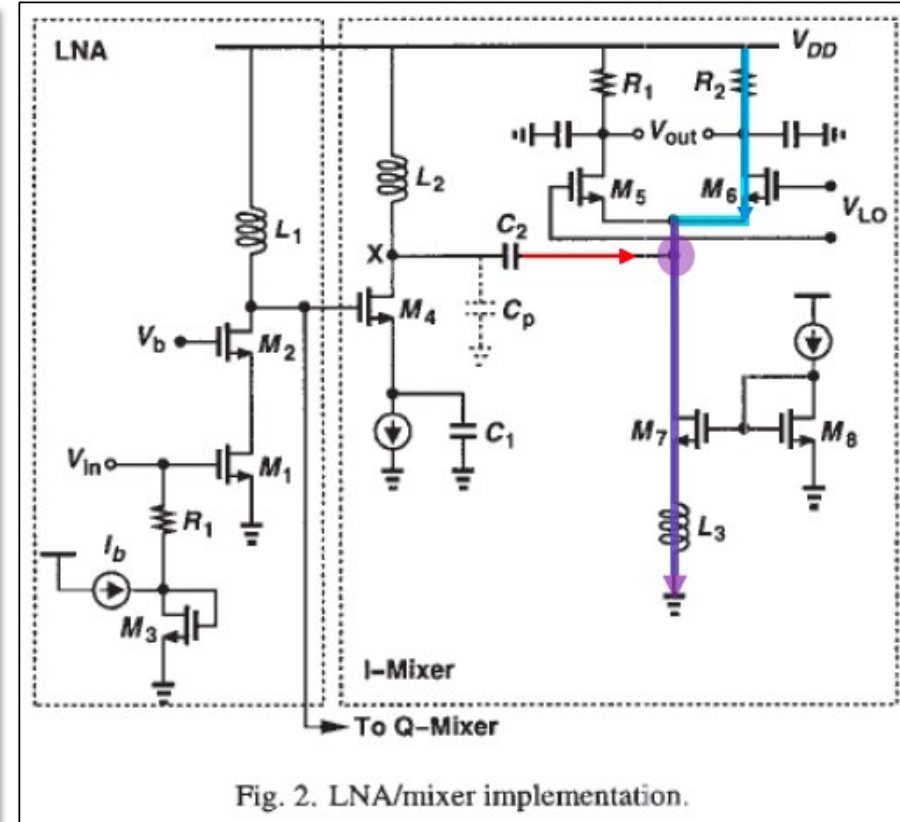
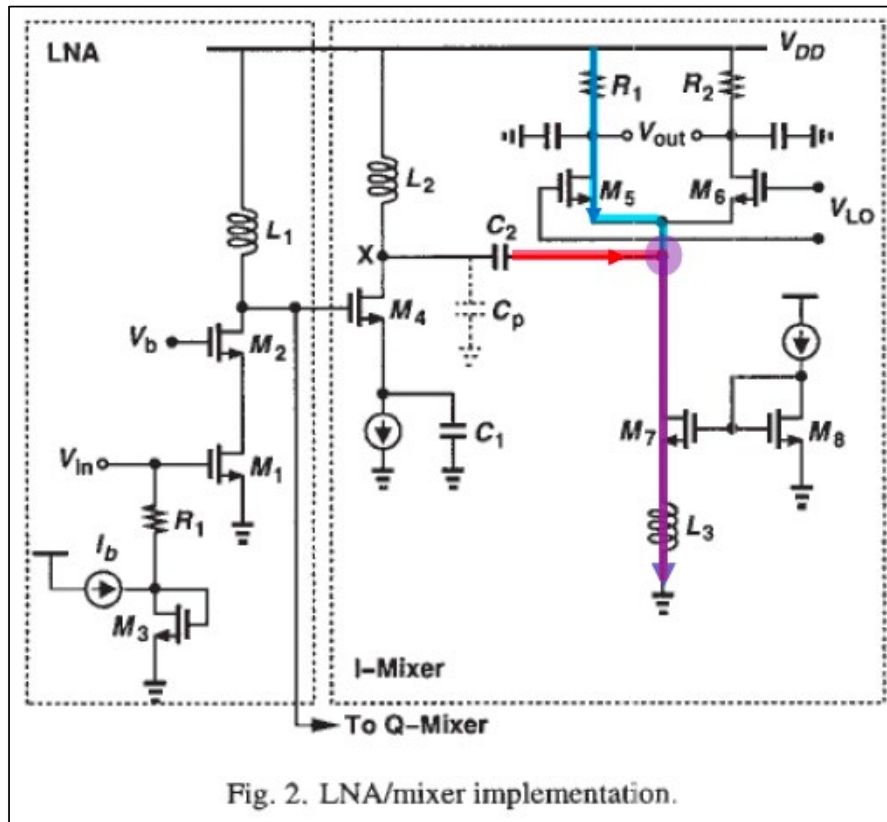
DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

109

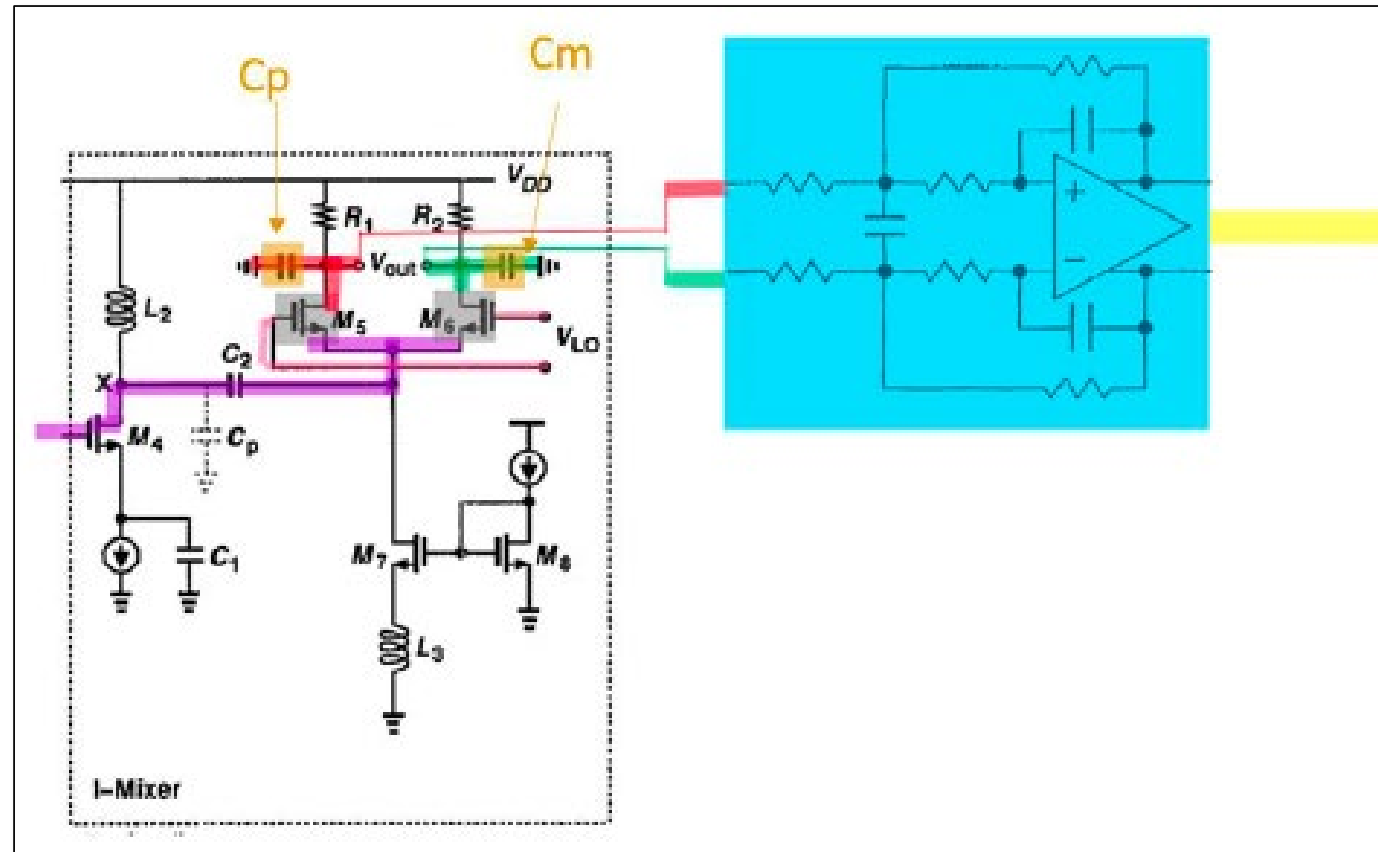
Razavi



Razavi



Razavi/Macnally

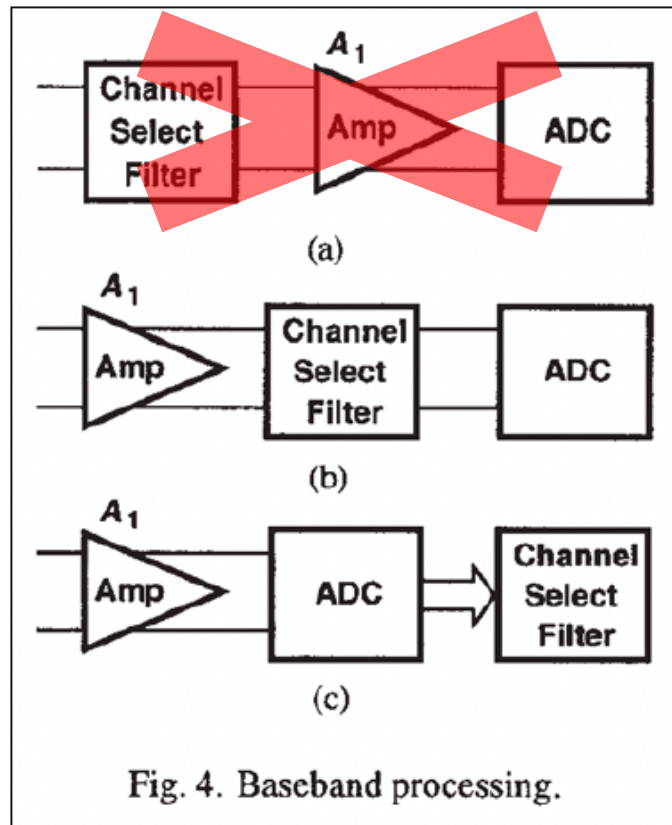


POR, 104.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

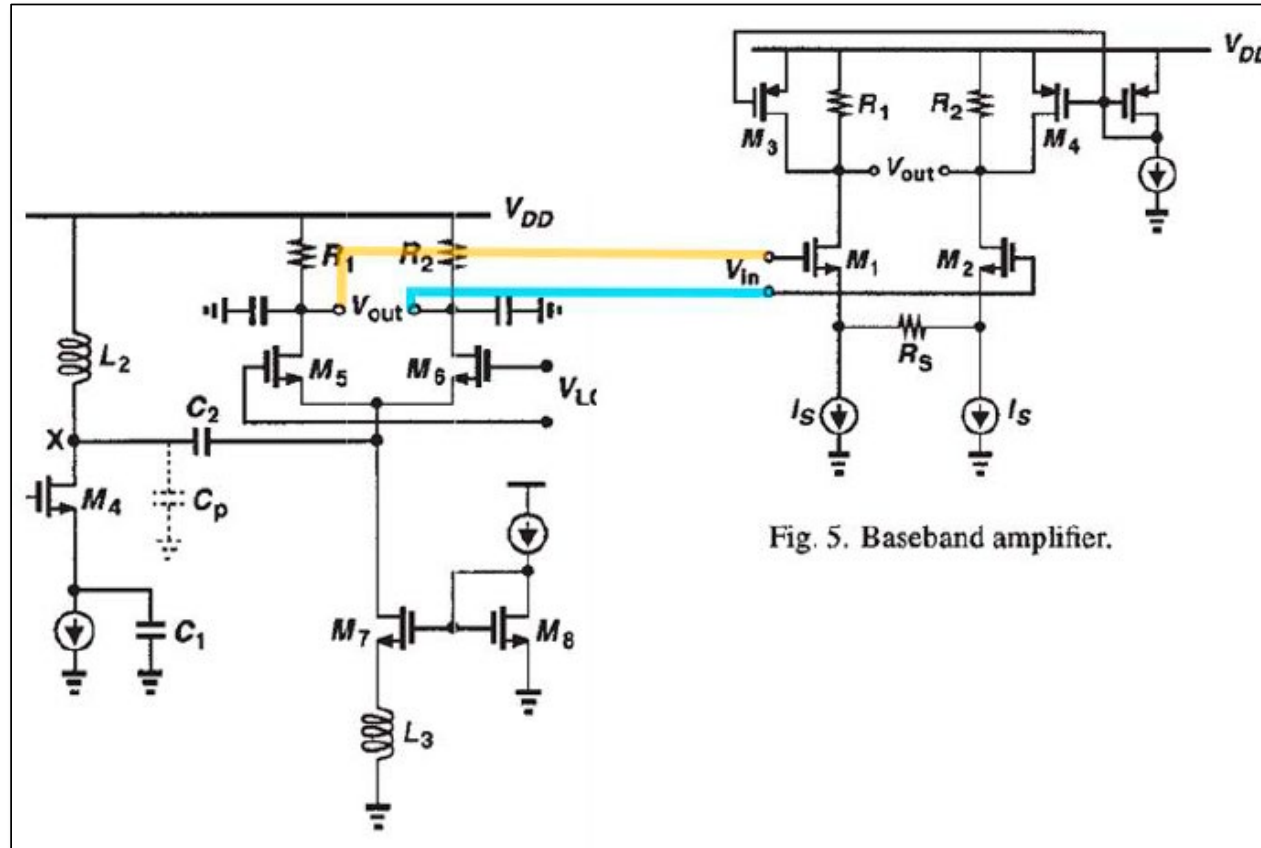
112

Razavi Teaches Away From the Proposed Combination

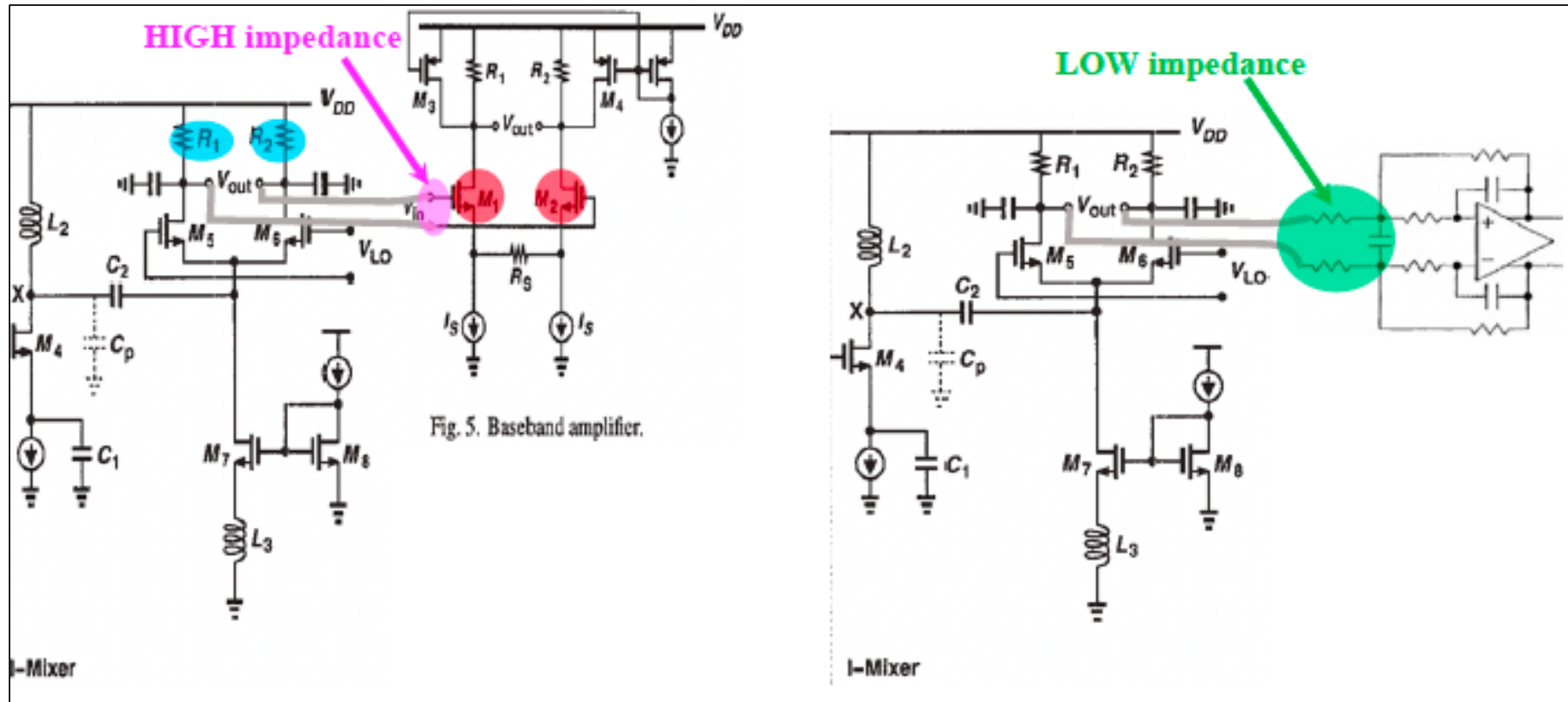


The downconverted signal can be further processed by one of the three permutations depicted in Fig. 4 [3]. In Fig. 4(a), a low-pass filter suppresses out-of-channel interferers, allowing A_1 to be a nonlinear, high-gain amplifier and the analog-to-digital converter (ADC) to have a moderate dynamic range. (roughly 4 to 8 bits depending on the gain control in the RF domain and the type of modulation). However, the low-pass filter design entails severe noise-linearity-power tradeoffs. The second permutation, shown in Figure 4(b), relaxes the LPF noise requirements while demanding a higher performance in the amplifier. The difficulty here is that the signals are still quite small and the interferers quite large. Thus, A_1 must exhibit both low noise and high linearity. The present design is intended for permutations in Figs. 4(b) and (c).

No Reasonable Expectation of Success



No Motivation to Combine Razavi and Macnally



POR, 60, 70; Reply, 35-36; Sur-Reply, 33-36.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

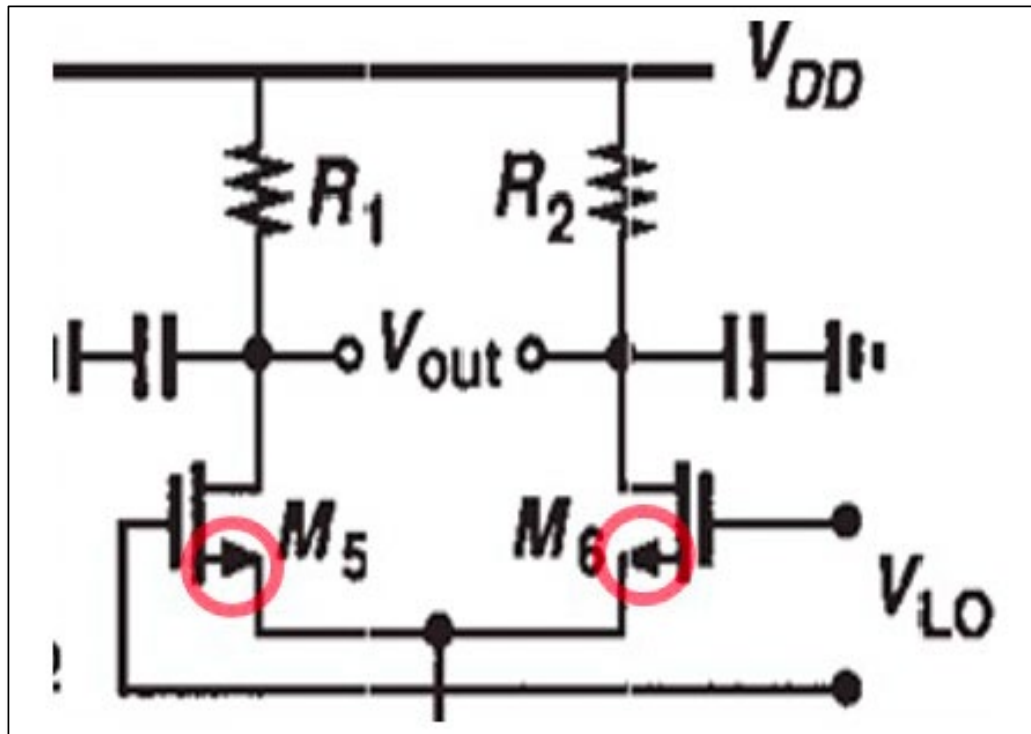
115

Razavi/Macnally Does Not Disclose Transferring Energy From A Modulated Carrier Signal

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

116

Razavi/Macnally Does Not Disclose Transferring Energy From A Modulated Carrier Signal



POR, 98-103; Sur-Reply, 36-41; Ex. 1017,1; Ex. 2042,62:3-10, 63:8-20.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

To achieve a high conversion gain, M_5 and M_6 must remain in saturation and, more importantly, the voltage drop across R_1 and R_2 must be maximized.

Galton:

Q. (BY MR. CHARKOW) Okay. In saturation, an NMOS transistor conducts current from drain to source, correct?

A. In --

MR. MAGEE: Objection to form.

A. In saturation, a -- an NMOS transistor conducts current -- conventional current from drain to source, yes.

117

Claim 14 Should be Analyzed Based on Conventional Current

Galton:

So the ParkerVision patents refer to conventional current. You know, when you're talking about charging and discharging, it's talking about conventional current or it's discussing conventional current, correct?

A. We'd have to look at specific cases, but that's probably true.

Q. In circuits, "I" -- the letter I, capital I, stands for current, correct?

A. Often, yes.

Q. Okay. And "I" refers to conventional current, correct?

A. Sorry. It often does.

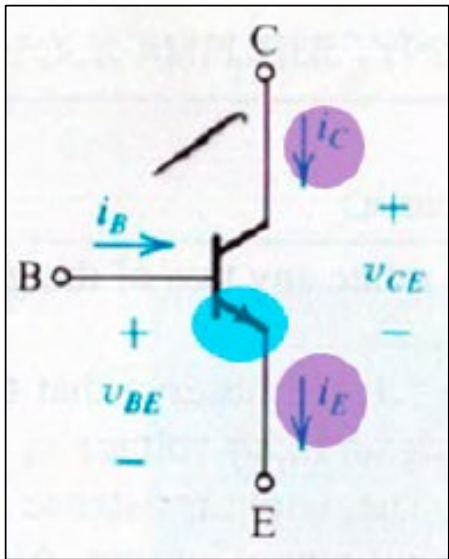
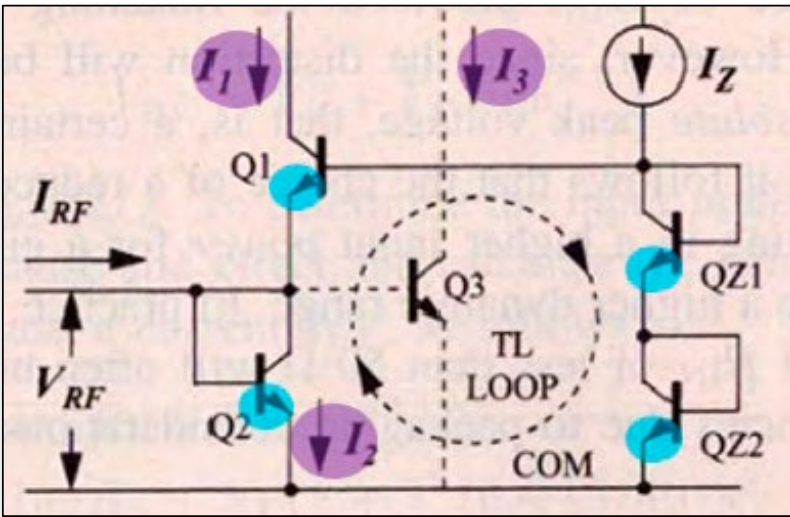
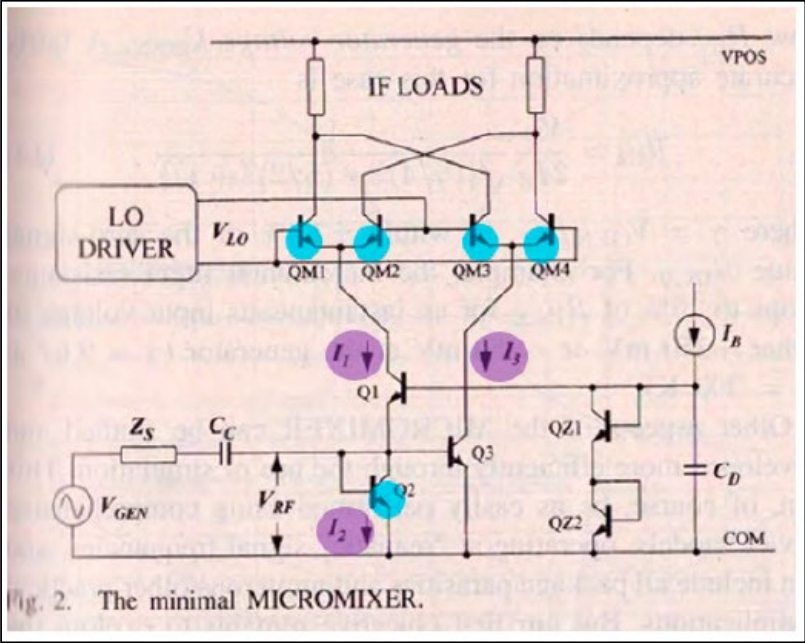
Sur-Reply, 38-41; Ex. 2042, 19:16-20:1,
21:19-24:5, 61:16-62:2.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

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Claim 14 Should be Analyzed Based on Conventional Current

Petitioner's Technical References:



Sur-Reply, 38-42; Ex. 1053,13; Ex.-1046,40; Ex. 1045,25,34,76,77.

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

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Other Issues Petitioner Fails To Address

DEMONSTRATIVE EXHIBIT - NOT EVIDENCE

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First, Ricketts explains that Razavi uses an amplifier specifically designed to achieve high gain, improve linearity, and reduce noise. Thus, there is no motivation to replace Razavi's amplifier with Macnally's filter. POR, 105-106 (citing Ex.-2024, ¶385). Petitioner does not counter this in the Reply.

Second, in response to Galton's strawman argument that Macnally's filter offers advantages (e.g., cancelling interference, minimizing distortion, and improving linearity) that motivate a combination, Ricketts explained that Razavi's design already addressed these issues. POR,106-107(citing Ex.-2024,¶¶388-89). There is no evidence that Macnally's filter would improve upon these things. Again, the Reply is silent in response.



Third, Ricketts quotes Razavi as explaining why Figure 4(a) depicts an approach that should not be used. POR,110. The Reply fails to address the quoted language.

Finally, regarding expectation of success, the Reply has no response whatsoever to Ricketts' argument that (1) Petitioner's reliance of Figure 4 ignores Razavi's explicit warning against doing so (POR,112), (2) incorporating Macnally's filter would require designing a complicated circuit, with no guarantee of improved performance over Razavi's amplifier (*id.*), and (3) because Macnally's filter would change Razavi's operation, there is no reasonable expectation of success of reproducing a baseband signal (POR,113-114).

Petitioner's Reply Violates 37 C.F.R. § 42.6(a)(3) and C.F.R § 42.22(a)(2).

Petitioner submitted two expert declarations collectively spanning *107 pages* (over *20,000 words/185 paragraphs*) of *substantive* analysis. But the Reply itself contains only short, conclusory arguments, followed by citations to numerous paragraphs in these declarations. *See, e.g.*, Reply, 10 (citing TI-1067, ¶¶16-20), 12 (citing TI-1067, ¶¶19-22), 23 (citing TI-1066, ¶¶11-35), 24 (citing TI-1066, ¶¶36-40), 25 (citing TI-1066, ¶¶44-51), 32-33 (citing TI-1066, ¶¶102-139).